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PROMOTION OF THE MECHANIC ARTS.

DECEMBER, 1857.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Practical Views on the Proposed Improvement of the Ohio River. By W. Milnor Roberts, Civil Engineer.

(Continued from page 303.)

Appendix B.—Facts Connected with Dams and Rivers.

Monongahela River.—Below Brownsville the river banks are generally from 30 to 50 feet high, except two or three instances, where they are not more than 25 feet. The average width of the river is 900 feet. The lower bottom lands seldom exceed 300 yards in width, on one side only; the *widest* being less than half a mile near Pittsburgh.

Above Brownsville, thence to the State line of Virginia, the river banks are from 35 to 55 feet high. The average width of the river is 600 feet. The lower bottom lands from 50 to 200 yards wide, on one side only.

Kentucky Rivers.—The following information was furnished by Sylvester Welch, Esq., Civil Engineer, to the writer in 1839. Mr. Welch at that time was Chief Engineer of the State of Kentucky.

"The floods in the Green River rise from 40 to 50 feet, and in the Kentucky River from 30 to 55. The Licking River having more descent seldom rises over 40 feet.

"There are several mill-dams upon the Licking from six to ten feet high. When the river rises from eight to twelve feet, or higher, (about five feet on the dams,) *flat boats with full loads* of iron, or agricultural

produce, pass over them without inconvenience. When the water is five feet or more upon the wier of the dams, the surface below rises so as *nearly to coincide* with the surface above. *A canoe could then pass with safety.*

"When we can do so conveniently, we make the lifts of our locks about fifteen feet, but they vary from *ten* to *eighteen.*

"All the works in our rivers will be covered with water during high floods. We raise our lock walls ten feet on the Kentucky, and eight feet on the Licking, above the top of the dam. The abutments will be raised a little higher than this.

"When the water runs so as to be *eight or ten feet* deep on the weir of the dams, the surface below will come up *nearly to the same level* as that above, (the fall will be distributed along the pool,) and steamboats may pass up or down over the dams. When the water rises much above this, there will be no perceptible difference between the level of the surface above and below the dam, and the current will not be strong enough to act injuriously upon the banks of the river, or upon the works connected with the dams."

The following facts were derived during the same year, (1839,) from Edward F. Gay, Esq., Civil Engineer. They are contained in his report relative to a survey he made along the Allegheny River, in 1828. These remarks refer to the slackwater navigation on the Conestoga navigation, constructed by him; and they are the result of practical observations. He states, "that previous to the improvement of that stream, high-water marks were seen along its banks from *ten* to *twelve* feet above the surface of common low water. This was said by all to be the usual height of the freshets; and from this fact, the possibility of constructing permanent dams on the stream was doubted by many. The dams, however, were built, varying in height from *ten* to *fourteen* feet above the bed of the stream; and in no instance since their construction has a rise of the freshets in the ponds exceeded *three* feet; whereas, in the unimproved parts of the river, the same complaints are heard of its rise as formerly.

"This extraordinary difference is easily accounted for by its increased surface in the pools, and its unobstructed discharge over the dams."

On the same subject we would present some extracts from the report of Sylvanus Lothrop, Esq., who was the Chief Engineer of the Monongahela slackwater navigation in 1846. "It affords me great satisfaction to be enabled to state, that since the last annual report, the navigation has not been interrupted or delayed in a single instance, by the breaking or failure of any part of the works or fixtures connected with the improvement, but has continued in successful operation at all times, when free from ice, except on a single occasion, and that *for one day only*, when it was partially obstructed by a flood in the Monongahela, so high as to cover two of the locks, *and to enable steamboats* to pass over the dams." "The walls of the locks being *ten* feet above the combs of the dams, it would require a rise of *more than* 20 *feet* in the natural condition of the river to submerge them. It may be proper, however, to remark in connexion with this circumstance, that, so far as the public is

concerned, a casualty of this sort, how frequently soever it might happen, would be attended *with no inconvenience* to them whatever, as the boats and other craft engaged in the navigation can always pass over the dams, whenever, and even before, the operation of the locks is suspended by high water. The principle which has heretofore generally been admitted, is now *ascertained by actual* experience and observation to be correct, that whenever the waters of the Monongahela swell to an elevation of *eight feet upon the combs* of the dams, they *then cease to back the water*, and the flood is no higher in consequence of their erection. The fall being then distributed along the pools, and the surface nearly equalized, both above and below, they can be passed in either direction by steamboats of the largest class employed in the trade, without hazard or delay."

Comment upon such facts, thus clearly presented, would be superfluous. But in justice to Mr. Lothrop, another extract from the same report seems proper, as containing the views of a gentleman of admirable cool judgment, and great practical experience. Mr. Lothrop says, "There is another point of view, however, in which this work may be considered important to the country at large. Its successful completion and opening (although under circumstances the most adverse,) at an expense scarcely one-half of that of our ordinary lines of canal, while its capacity for business is so immeasurably greater than any work of that description which has ever been constructed, are calculated to furnish another striking illustration of the advantages of this species of improvement, and thereby to lead to the earlier development of the susceptibilities of our Western streams. To the Ohio River itself, which is the common highway of so many States, and to many other of its most important tributaries, its applicability will be found, on examination, to be not less apparent, than to the Monongahela."

We take the following from the Ninth Annual Report of the President of the Monongahela Navigation Company:

"The stockholders will no doubt be gratified to learn, as the Board are to inform them, that, as in former years, no interruption has occurred in the navigation for a single day, from any of those causes to which this improvement was supposed to be so peculiarly exposed; high and low water have proved alike harmless; while the favorite idea of a long obstruction from the formation of ice upon its deep and quiet pools has been exploded by the fact that, for the *last three winters*, the boats employed in the trade have been making their daily trips to Brownsville, *while the river was locked up by ice beyond that point.*" A fact like this is of more practical value than any theory, however beautifully elaborated.

Extracts from the Report of the President of the Monongahela Navigation Company, dated January 6, 1851:

"On the third day of November, 1844, your navigation was completed, (29 miles had been completed and in use four years longer,) and the locks opened for the passage of boats; and during the period that has since elapsed, of more than six years, it has been *subjected to the severest tests of floods and ice* without suffering any material injury, or requiring

any extraordinary repairs, and is now in good order, thus giving the strongest demonstration of the strength and durability of the work.

"The amount of toll collected during the six years since the completion of the work, is as follows, viz :—

For the year 1845,	$28,579·70
" 1846,	43,422·39
" 1847,	54,261·90
" 1848,	56,623·93
" 1849,	53,756·32
" 1850,	64,318·31

"The shipment of coal increased from 4,605,185 bushels in 1845 to 12,297,967 bushels in 1850.

"It is gratifying to be able to state, that during the year 1850, the *navigation was not suspended a single day by ice or any other obstruction.*"

Probably no canal in the United States, at any period of its history, can claim such exemption from interruption.

Mr. Ellet, in his *eighth* objection to locks and dams, founds it mainly upon an accident which occurred at one of the locks on the Monongahela, in 1851, which interfered with the navigation four days. In order that all who feel interested should be able to judge how much weight it is entitled to, an extract from the Annual Report of Gen. Moorhead, President, dated January, 1852, is here given.

"The obstruction referred to, was the result of a forcible displacement of the lower gates, occasioned by an ascending boat, while the steamer *Atlantic* was in the act of passing in the same direction through the upper ones. Through some mistake or mismanagement on the part of the pilot of the former, she was driven by the force of steam against the lower gates, with such a momentum as to force one gate upwards against the full head of water, while its fellow, left without other support than the mitre sill, and exposed to the whole force of the accumulated flood, was swept downward and torn from its fastenings by the violence of the current. The effect was, of course, to close the upper gates at once upon the *Atlantic*, with a force that held her there as though she had been compressed by the jaws of a vice, while the torrent rushed through the lock with all the force and velocity which a head of eight feet would naturally impart to it. Fortunately, however, a pair of new gates was *in course of preparation* and *nearly* completed; and although the extrication of the steamboat, and the shutting off the water from the lock proved to be a laborious and expensive task, it was successfully accomplished, and the new gates suspended, under the personal superintendence of the President, within four days of the occurrence of the accident."

"In order, however, to provide against the recurrence of any similar casualty, arrangements were made for the preparation of extra gates."

In Mr. Ellet's reference to this, as a disaster to be apprehended on the Ohio, he inadvertently states that the gates were *ready*, whereas, they happened to be only nearly ready. But now, when we see a navigation successfully carried on for over seventeen years, with but a solitary accident of this nature; and when we know that all public improvements having locks where steam is used are subject to the same, and we hear of no fellow to such an accident, how much consideration should be given

to it in a comparison of the advantages and disadvantages of a great system!

In the same Annual Report, it is stated, that "the excessive cold with which this region has been visited, at the commencement of the present winter, resulted, as might have been expected, in locking up the whole river, and entirely suspending navigation as early as the 17th of December." "A like occurrence took place in 1846, when the navigation was interrupted for a period of three weeks; and then, as now, the *accumulated masses of ice passed off without doing* any material damage to the structures under our charge.

"Since the winter of 1846, until the present one, navigation has never been suspended three days at one time in consequence of ice; and judging from past experience, we may not anticipate a similar interruption for many years to come."

Drought, 1854.—In 1854 there was a great drought. It is thus mentioned in the Annual Report of the President of the Company, of January, 1855:

"In July, however, the effects of the drought began to be felt; and on the 27th of that month, the water became so low that the large packet boats ceased to run during a period of nearly three months, and were not able to resume their trips until the 17th of October. During a part of that time, however, smaller boats were run; but the water was still so low, that even they could carry little or no freight, and the common coal flats could not be towed over the improvement with full loads: in fact, business upon the river during that period was virtually suspended, *an occurrence heretofore entirely unprecedented.**

"A slight rise about the middle of October enabled the packets to resume their trips; but the water did not rise sufficiently to let out the coal boats, which were loaded for the western markets, until after Christmas.

"Many of these boats were loaded in May, and kept afloat at the expense of their owners during the entire summer and fall. The water, during the greater part of that time, not only ceased to run over the dams, but by evaporation and leakage became almost literally dried out of the pools."

1855.—Extracts from the sixteenth Annual Report of January, 1856.

	STATEMENT OF COAL BUSINESS.	
	Number of bushels.	Amount of tolls.
1845	4,605,185	$ 5,283
1846	7,778,911	10,221
1847	9,645,127	13,241
1848	9,819,361	12,438
1849	9,708,507	13,533
1850	12,297,967	17,023
1851	12,529,228	17,850
1852	14,630,841	20,014
1853	15,716,367	21,291
1854	17,331,946	25,079
1855	22,234,009	31,050

* When the navigation had been in use fourteen years.

"An examination of the quantity of coal that passed the improvement during the last year, and the revenue derived from it, shows the toll to be but *one mill and four-tenths* per bushel, or less than *four cents* per ton! A tax so inconsiderable should not be complained of, particularly as the construction of the improvement has greatly augmented, if not created, the business." *Yes, it created it!*

"Another important feature in the coal business worthy of remark is, that the transportation of it to Cincinnati, Louisville, and many other places, is *now done in barges* instead of the old-fashioned boats. These barges are towed down and back by steamboats built for the purpose." "By this means the cost of boats is saved. A great saving is also effected in running them, as one steamboat will tow down from eight to twelve barges, and the same number back empty. It is believed that by that mode, coal can be delivered from one to two cents per bushel cheaper (28 to 56 per ton,) in western ports than by the old system. When the Ohio River is improved by the construction of an artificial navigation, as it should and it is hoped will be by the aid of the General Government, these coal barges can be run during the entire season, except when navigation is suspended by ice. The regularity with which coal could then be supplied, would increase the demand to an unlimited extent."

"The Board are pleased to see public opinion turned to this subject. It is one of great and national importance, and passing, as the Ohio River does, through six States, commends itself to the fostering care of the General Government."

1856.—The year 1856 was a memorable one, not only on the Monongahela River, but on all western streams, and especially on the Ohio and Mississippi rivers. All were much lower than they were ever known to be before, while the interruptions from ice were also beyond all precedent. Thus from January 1st to March 23d, and from December 21st to December 31st, making 94 days, closed by ice during the year 1856.

From 1845 to 1855 inclusive, eleven years, the average annual interruption from ice was but 20 days, whilst in the single year of 1856, there were 94 days. This shows most strikingly the great severity of that winter.

But this was a year of disaster to the navigation company. "On the 14th of May a breach occurred in Dam No. 2, carrying away nearly two hundred feet in length of that structure, which greatly interrupted the navigation. Immediate and active measures were taken to repair it, and the work was accomplished at an expense of more than seventeen thousand dollars. The river commenced falling immediately after this disaster occurred, and with the exception of a slight rise of about two feet, during the progress of the work, the stage of water was very favorable for making the necessary repairs. After these were completed, and the navigation resumed, the river continued to fall, until the water became so low in the different pools, as to suspend the navigation entirely: [*drought*,] and from the 14th of May until the 1st of December, a period of more than *six months*, there was at no time a sufficiency of water either in the *Monongahela* or *Ohio* rivers to float coal boats."

"Some idea of the extreme lowness of the river may be gathered from the following statistics, which are so remarkable as almost to challenge belief; but as the measurements were made with great care, at different points, and by different persons, and corroborate each other, they form strong proofs of the facts."

"Below Dam No. 4 [a few miles below Brownsville,] the water was gauged by the President of the company, on the 1st day of October, 1856, and the quantity passing per minute, was found to be but 1492 cubic feet. Mr. Charles Stewart, the Engineer, gauged it at the Brownsville Bar, on the 8th of October, 1856, and the quantity passing per minute was 1365 cubic feet. In 1838, W. Milnor Roberts, Esq., gauged the Monongahela at its lowest stage, and ascertained the quantity passing to be, per minute, 12,000* cubic feet—more than eight times as much as either of the above measurements. Charles Ellet, Esq., made examinations during the summers of 1843, 1844, and 1845, at the Wheeling Bar, and the minimum quantity reported by him was, September 30th, 1844, about 70,000 cubic feet per minute. Nothing could more forcibly illustrate the extreme lowness of the water than these figures; and as the great drought of this year continued for so long a period, it satisfactorily explains the small receipts of the Company."

Appendix C.—Disinterested Testimony.

Time of passing Locks, Cost, &c.

Extract from a report published by a company of gentlemen who made an excursion of examination along the Monongahela Improvement in 1845, after the entire completion to Brownsville.

"The subscribers were especially pleased with the opportunity afforded them, of examining the substantial workmanship of the locks, and the admirable machinery by which the gates are worked on the Monongahela slackwater. They were both surprised and gratified to find that the very large locks could be filled, and the steamboats passed through each of them, with a detention not exceeding SIX MINUTES. They were thus fully convinced, that a durable improvement has been made, which secures safe and rapid communication between Pittsburgh and Brownsville, except when closed by ice."

The names appended, are, N. B. Craig, Esq., Hon. R. C. Grier, Hon. John C. Plummer, John Anderson, Esq., B. B. Hart, Esq., Philadelphia, Henry Hall, Esq., Balt., Lieut. John Rodgers, U. S. N., C. H. Fuller, Civ. Eng., Hon. James Bell, C. W. Smith, Esq., N. O., E. J. Martin, Louisville, Col. Robert Orr, J. L. Neff, Maryland, Lieut. J. L. Parke, U. S. N., John D. Davis, William Eichbaum, Josiah King, and others.

And yet, without regarding evidence of any kind, and the experience of twelve more years of successful navigation on that work, the

*The measurements which gave 12,000 cubic feet per minute, was above, but near *Pittsburgh*.

It is true, that one of the measurements of the writer at Brownsville, August 30th, 1838, gave 12,420 cubic feet per minute. It was, however, measured again, September 19th, and found to be 4500 cubic feet, and this was the *actual* period of the lowest water during that extraordinary season.

opponents of the lock and dam system, continue to assert, though without any proof whatever, that hours instead of minutes are to be consumed in the passage of a single lock. And in regard to cost: a new lock, with chamber 250 by 56 feet, planned in 1852, by Sylvanus Lothrop, Esq., then Chief Engineer, was estimated to cost $45,000.

In 1853, the company determined to extend the slackwater from Brownsville to the Virginia State line, and thus refer to it in their report of January 2d, 1854:

"An accurate survey of the river from the mouth of Red Stone Creek to the State line, was made in September last, by John White, Esq., a highly competent engineer. The entire ascent to be overcome by the dams, is 41·8 feet, corresponding very nearly with the original survey made in 1838, by Mr. Roberts. Mr. Lothrop, the Engineer of the company, proposes to overcome this by three dams of *fourteen* feet each, which have been located by him and the President, as follows:

"No. 5, at Bennett's Bar, 2 miles above Brownsville.

"No. 6, at Rees's Landing.

"No. 7, at Jacob's Creek, lower ripple.

"It is believed that the three locks and dams can be constructed, for cash, for about one hundred and fifty thousand dollars." But $ 50,000 each!

These dams are five feet higher than those proposed on the Ohio river, being 19 feet from the bed of the stream, and 14 feet from the pool—the height from pool to pool being 6 feet more than on the Ohio. They are therefore necessarily more costly structures *per foot of length*, though only about half the average length of the dams proposed on the Ohio. The locks will also have 6 feet more lift than those proposed on the Ohio: other dimensions being equal, the additional lift would, of course, increase the cost. From this it may be inferred that the estimate of cost in the Ohio, as contained in the paper of the writer, is liberal.

APPENDIX D.—FACTS IN RELATION TO NAVIGATION ON THE OHIO RIVER.

The following letter in answer to certain interrogatories submitted by F. R. Brunot, Esq., of Pittsburgh, is from one of the most experienced and reliable captains navigating our western waters.

Between Pittsburgh and Cincinnati.

1. The best stage of water for the packets would be about 15 feet at Pittsburgh and 20 feet at Cincinnati.

2. From Pittsburgh to Cincinnati, time down about twenty-eight to thirty hours. Has been done in 27 hours down, and 44 hours and 57 minutes up.

3. The average landings down in a business trip would be about 22—up about 40. When running against time, as was the case when the shortest time was made, mentioned in my answer to your second question, the landings down would not be more than two or three, and up they would stop their engines long enough to take a wood or coal flat in tow about three times, *not landing at all.*

4. The higher the water the more time lost in rounding to—about fifteen minutes would be a fair average.

5. The average time out from Port to Port round trip, is about five and a half days. About thirty-three hours lost at Cincinnati, and about eleven hours landing.

6. In low water, the time consumed in the round trip, would not be much greater than that in a "high water trip;" they are longer going down, but lay a shorter time at Cincinnati, and up perhaps from *six to twelve hours* longer than in high water.

7. During the flood of 1847, some of the boats came into Port at Cincinnati and had to lay up, not being able to discharge their cargoes. Others stopped for fear of not being able to get fuel on their route. During the flood of April, 1852, I had to lay over one trip, and lost a week with the "*Allegheny*," (one of the Pittsburgh and Cincinnati packets,) on account of the "Wheeling Bridge"—river being too high to let her Pilot House pass under, after her chimneys were lowered.

8. The ordinary rates of freight in good stages of water up from Cincinnati to Pittsburgh were, last spring, about fifteen cents per 100 pounds, and in very low water twenty-five and thirty cents per 100 lbs.

9. It most assuredly would be advantageous to the steamboat interest to have a full regular supply of good coal for steamboat use at moderate rates always on hand at all points along the river, as the boats here are all so constructed as to burn coal altogether when they can get it.

10. For economy, and quick to generate steam, we think the Pittsburgh coal the best in the western or southern country.

11th Question. How much of each year, on an average, are steamboats laid up on account of low water in the Ohio River?

Answer. This depends somewhat on the season, whether wet or dry; in ordinary seasons the packets were laid up about *three and a half months* on an average, but they are constructed for speed and of heavy draft; we have a class of boats that run the whole summer, or as long as there is twenty inches of water in the channel.

12th Question. Suppose we had a stillwater lake between Pittsburgh and Cincinnati, what would be the probable time required to make the round trip, no current either way? Could it be made quicker than in the natural river on a good stage? How much, probably?

Answer. I think the time required to make a round trip from Pittsburgh to Cincinnati and return by one of our packets on "stillwater," would be about five days. The ordinary time in a business trip I have said in my answer to your fifth question, is about five and a half days, round trip. One-sixth of the difference is saved in not having to round to going down, the balance in having no current to contend with up stream."

C. W. Batchelor.

In a slackwater navigation, as proposed, there would be fifty-four locks between Pittsburgh and Cincinnati. Allowing twelve minutes for each lockage, it would amount to $10\frac{3}{4}$ hours each way, or $21\frac{1}{2}$ hours in the round trip. Hence, it would appear that even with the natural river

in a favorable stage, as compared with the slackwater navigation, the difference of time in a round trip would be trifling; and in low water, that difference would be in favor of the slackwater. There are various other considerations which the intelligent communication of Captain Batchelor cannot fail to suggest to the reader, some of which have been discussed in the text. The equalization and reduction of the cost of freighting which will surely attend the opening of the slackwater navigation, is not the least among them.

While the season of 1856 was remarkably unfavorable for river business on account of long continued low water, causing immense losses to merchants, manufacturers, and others, and curtailing and injuring the coal trade; that of 1857, owing to a better supply of water, has been quite favorable. As a consequence, the commercial and other interests along the river have been in a highly prosperous condition, and the coal business has been greatly stimulated. This extensive business will this year exceed a million of tons, and quite a large proportion of it is now carried on by means of *barges*, even with the river in its natural state; so that what was considered experimental a few years ago, is now an established custom. It needs only a constantly reliable navigation to render it universal.

Appendix E.—Respecting the Improvement of the Mississippi River.

The United States Government has been engaged for several years, in the execution of a plan for improving the lower rapids of the Mississippi.

These rapids are designated as the "Des Moines rapids" or "lower falls." They extend from Montrose to Keokuk, at the extreme south-eastern corner of Iowa, and occupy about 12 miles of the river.

The total fall in this distance is 24 feet, or an average of 2 feet per mile—divided between a number of ripples and pools.

The stream is from three-fourths of a mile to one mile in width.

Its bed is solid limestone rock; not in one smooth even declivity, but disposed, as just intimated, into *comparatively* level parts, and intervening broad flat ridges, extending across the stream; partially broken by a very irregular winding channel, which in low water becomes useless.

In very low water, vessels drawing two feet cannot pass. During floods, and generally for about two or sometimes three months of the spring and early summer, steamers drawing four feet, or more, can ascend and descend; and during this period, the immense rafts of timber and lumber from the upper waters, float safely over. But usually, for the remainder of the year, even light steamers are compelled to run the falls empty, while the freight is conveyed by lighters, drawn by horses. Occasionally, of late years, small steam tugs, instead of horses, have been used part of the time.

During the present year (1857), a railroad has been opened along the west bank of the river from Keokuk to Montrose, 11 miles, affording a new conveyance for passengers and freight, *around* the falls. This is

the first completed division of the Keokuk, Mount Pleasant, and Muscatine Railroad.

About 10 years ago, a company was incorporated under the laws of Iowa, with authority to construct a *hydraulic ship canal* around the rapids. Surveys, maps, estimates, and reports, were made. Nothing more has yet been done, except to continue the company in being.

The plan adopted by the General Government is, to blow out the rocks under water, so as to form an artificial channel through the flat ridges, sufficiently wide and deep for the convenient passage of steamers and other craft, at all times.

Although several years have elapsed since this work was commenced, and many thousands of dollars have already been expended, very little has yet been accomplished. Nothing that is yet of any practical use. It is evident to those who have had opportunities of witnessing the scene, and the operations, knowing the short period each season during which they can be carried on, that many years of tedious and costly labor will be required to complete a channel on this plan. When completed, the channel would be crooked; and although steamers might ascend it safely, some trouble would be encountered in descending. It is doubtful whether the large rafts could be navigated through it at all.

The effect of cutting such channel, or channels, through the ridges, (which are in fact rock-dams) must necessarily be, to *reduce the natural depth* in the intervening pools, and on the ridges, and in all parts of the stream, except immediately in the channels. In the channels, the depth must be increased, though not to the full extent of the excavated depth; while, at the same time, the velocity of the flow through the channel will be greater. The worst effect will be, the reduction in the depth of water *above the head of the rapids* at Montrose, and for some distance above. This may prove to be a serious evil, inasmuch as there are shoals on that part of the river which will not admit of any reduction in the depth of water over them without permanent injury to the navigation.

A more philosophical, and the writer thinks, a more feasible and much cheaper plan, admitting of completion in one, or at most two seasons, would augment the depth in the channels, and increase the depth on the shoals immediately above the rapids. Thus, instead of attempting to blow out a channel through the solid rock ridges, let the channel be formed by bolting timbers (on the ridges,) across the stream from either shore; leaving a given width, say 500 feet, near the middle, or in the most convenient part, in its natural state. Suppose three lines of square timber laid side by side bolted to the solid rock; two lines of timber bolted on this lower course; and one line of timber bolted to the second course; we have a solid timber dam, say 3 feet high above the top of each ridge. This would raise the water at each ridge not less than 2 feet—perhaps 2½ feet or more, and afford 4 or 5 feet depth from one end of the rapids to the other, at the same time raising the water at the head of the rapids, not less than two feet above the low water height. Assuming the river to have an average width of 4500 feet, and that there should be eight such semi-dams, it would take 192,000 feet lineal of 12 inch square timber at 30 cents per foot; and allowing 270,000

pounds of wrought bolts, at 15 cents per pound, and twenty per cent. for contingencies, the entire cost would be but $153,720!

Another mode of improving these rapids is, by means of a *single dam*, raising the water 24 feet at the lower end, with two locks of 12 feet each, which is entirely practicable, at a cost of less than a million of dollars!

Ultimately, should the General Government fail to improve these rapids radically; and perhaps in any event, the hydraulic ship canal will be constructed on the Iowa side by the company named, affording one of the most magnificent water powers in the world, and giving a constant reliable navigation. A small portion of the surplus water will be used in supplying the growing City of Keokuk with pure wholesome water. Is there any good reason why the government should not construct this canal?

ERRATA.

Page 23, line 12—after the word "*even*" there should be a comma.
" 17—for "*shores and*" read "*thousand.*"
24, " 8—for "*cleaning*" read "*clearing.*"
26, " 6—for "*cleaning*" read "*clearing.*"
76, " 15—for "*high*" read "*height.*"
78, last line for "*draughts*" read *droughts.*'
80, line 17—for "*draught*" read *drought.*"
80, " 20—for "*foot*" read "*feet.*"
84, " 20—the semicolon should be a colon.

For the Journal of the Franklin Institute.

*On the Calculation of Road Excavations and Embankments, when the Ground is a Warped Surface.** By W. M. Gillespie, LL. D., Professor of Civil Engineering in Union College, N. Y.

When an engineer is laying out a road or railway, he has to determine the amount of earth necessary to be removed in making the "cuts" and "fills" of the road. To do this, his most usual course is to take "cross sections" or "profiles," of the ground at right angles to the line of road, at convenient intervals, and then to calculate by various methods, commonly near approximations, the volume included between each pair of these cross-sections. The distances apart at which these cross-sections are taken, are determined by the engineer according to the nature of the ground; his aim being that there shall not merely be no abrupt change of height between each pair of these cross-sections, but that the surface from one to the other shall *vary uniformly;* gradually passing, for example, from a small to a great degree of slope, or from a slope to the right into a slope to the left, without any sudden variation at any one place.

The surface fulfilling this condition of varying uniformly, since it is everywhere straight in some direction, is evidently a *ruled surface;* and since the extreme profiles are seldom parallel, it will be a *warped* or *twisted* surface.

Our engineers have been accustomed to consider these surfaces as not admitting of precise calculation, but only of a degree of approximation

*An abstract of the earlier portion of this paper was read at the late Montreal meeting of the "American Association for the Advancement of Science."

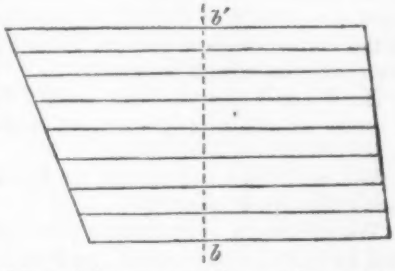
varying with the nearness of the cross-sections.* The object of this paper is to examine the correctness of this position. It will therefore have two parts: firstly, a discussion of the precise nature of the surface; and secondly, an investigation of a formula applying to it.

I. *What sort of a warped surface is the one in question; that is, what is its mode of generation?*

To determine this, we must inquire what the engineer means when he says that the ground "varies uniformly" from the place at which he stands, and at which he has just taken a cross-section, to the place at which he decides it will be proper to take the next cross-section; whether he means that the ground between the two is straight *cross-wise* or straight *length-wise;* straight at right angles to the direction in which the road runs, or straight in that direction.

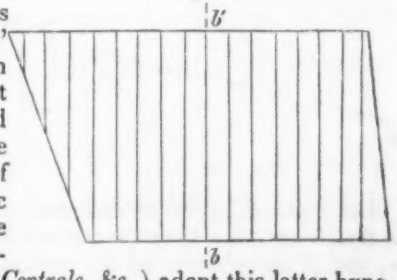
Probably few engineers ask themselves this question in so many words; but it would seem that the former conception, or *straightness cross-wise,* is the more likely to be what is meant, for the reason that any deviation from straightness in that direction, at right angles to the line along which we look, is much more easily seen than in the other direction. We can therefore much more readily determine whether the surface of the road is straight or curved from side to side than from end to end; and the surface which we pronounce uniform, is therefore much more likely to be straight cross-wise, than straight length-wise.

Fig. 1.



In geometrical language the former surface (which is represented in plan in fig. 1,) is generated by a straight line resting on the two straight lines which join the extremities of the two profiles, and moving parallel to their planes or perpendicular to the axis of the road. This surface is a "*hyperbolic paraboloid.*"

Fig. 2.

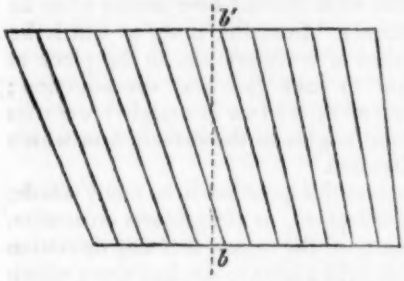


The latter surface (shown in plan in fig. 2,) is generated by a straight line resting on the two profiles, and moving parallel to the vertical plane which passes through the axis of the road. It also is a hyperbolic paraboloid, though a different one from the former. The French engineers (*Sganzin* I, 114; *L'Ecole Centrale, &c.,*) adopt this latter hypothesis. We have seen, however, that the former is the more probable one.

*"No practicable method of calculation will give a true result if the surface of the ground is much warped." Morrison's Tables, p. 13. "In railroad cuttings, it rarely happens that the ground surface lying between two consecutive cross-sections one hundred feet apart is absolutely unwarped; yet for practical purposes it may very frequently be assumed to be so. When much warped, the cross-sections must be taken closer together than one hundred feet." Trautwine's "New Method," p. 1.

The French hypothesis is farther objectionable on mathematical grounds. As soon as the generating line quits the end lines and rests on the side lines, it has new directrices, and the whole surface generated, is really composed of three different paraboloids; a want of symmetry alone is sufficient to cause the rejection of this system.

Fig. 3.



Fortunately, the practical difference between the two, is really very slight; for a very small change in the latter hypothesis will make its result identical with that of the former. Conceive the straight line which rests on the two profiles to move on them in such a way as always to divide them *proportionally*, as in fig. 3. The surface thus generated is identical with that of fig. 1; as is proven in the higher descriptive geometry.

This last conception is also more probably correct than fig. 2—even if we suppose the engineer to consider longitudinal straightness—since he is more likely to extend his imagination from all parts of one profile to the corresponding parts of the other, than in lines perpendicular to the profile on which he stands.*

II. *We will therefore now proceed to investigate the content of a solid, bounded on one face by a warped surface generated on the first hypothesis —the other faces being planes.*

We will take the case of an Excavation; that of an Embankment being the same inverted.

We will begin by considering the bottom of the excavation to be level, and its sides to be vertical; and will afterwards discuss the more usual form.

Fig. 4.

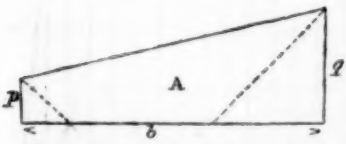
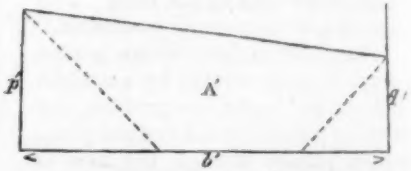


Fig. 5.



Let A and A' be the parallel sections at each end of the solid; b and b' their respective breadths; p and q the outside depths of the section A, and p' and q' those of the section A'; and l the length of the solid, measured at right angles to the planes of the sections.

*Since the above was written, the author has seen an abstract of the Lectures on Roads, given at "*L'Ecole des Ponts et Chaussées*," (the highest authority on such matters in France, and therefore in the world,) in which this last hypothesis is adopted. This removes the only obstacle to the acceptance of the principle which is here advocated.

In the models illustrating the original paper, the surfaces in question were formed by silk threads, representing the generating lines. The identity of the first and third surfaces, and the dissimilarity of the second, were then evident on mere inspection.

The outside depths are supposed to vary uniformly from p to p', and from q to q'.

Then, at x feet from A, the breadth $= b + \frac{x}{l}(b'-b)$; one outside depth

$$= p + \frac{x}{l}(p'-p)\text{; and the other} = q + \frac{x}{l}(q'-q).$$

The area of that section will therefore be

$$\tfrac{1}{2}\left[b + \frac{x}{l}(b'-b)\right] \times \left[p + \frac{x}{l}(p'-p) + q + \frac{x}{l}(q'-q)\right] \quad . \quad (1)$$

Arranging this expression according to the powers of x it becomes,

$$\tfrac{1}{2}\left[b\,(p+q) + \frac{b(p'-p+q'-q) + (b'-b)(p+q)}{l}x + \frac{(b'-b)(p'-p+q'-q)}{l^2}x^2\right]$$

The product of this by dx being the differential of the solid, the required volume is,

$$\int_o^l \tfrac{1}{2}\left[b\,(p+q)\,dx + \frac{b\,(p'-p+q'-q) + (b'-b)\,(p+q)}{l}x\,dx + \frac{(b'-b)\,(p'-p+q'-q)}{l^2}x^2\,dx\right] \quad . \quad . \quad . \quad (2)$$

Integrating from o to l, we obtain this expression,

$$\left[\tfrac{1}{2}b(p+q)l + \tfrac{1}{2}b(p'-p+q'-q)l + \tfrac{1}{2}(b'-b)(p+q)l + \tfrac{1}{3}(b'-b)(p'-p+q'-q)l\right]$$

Performing the operations indicated and factoring, we finally obtain for the required volume of the solid, this symmetrical formula,

$$\tfrac{1}{6}\,l\left[(b + \tfrac{1}{2}\,b')\,(p+q) + (b' + \tfrac{1}{2}\,b)\,(p'+q')\right]^* \quad . \quad (3)$$

We now propose to show that the volume given by the preceding formula (3) is the same as would be obtained by applying the familiar prismoidal rule to the given solid.

The area of the section A $= \frac{1}{2}\,b\,(p+q)$; and that of the section A' $= \frac{1}{2}\,b'\,(p'+q')$.

*Two particular cases of this general formula are worthy of special notice.

Let the base of the given solid be a parallelogram.

Then $b=b'$; and formula [3] becomes,

$\frac{1}{6}\,l\,[\frac{3}{2}\,b\,(p+q) + \frac{3}{2}\,b\,(p'+q')]\,l = b\,l \times \frac{1}{4}\,(p+q+p'+q') =$ The product of the base of the warped surface prism by the arithmetical mean of the heights of its four summits.

Let the base be a triangle.

Then $b'=o$, and $p'=q'$; and formula (3) becomes,

$\frac{1}{6}\,l\,[b\,(p+q) + b\,p'] = \frac{1}{2}\,b\,l \times \frac{1}{3}\,(p+q+p') =$ The product of the base by the arithmetical mean of the heights of the three summits.

These two formulæ are also true when the upper surface of the prism is a plane, since a plane is only a particular case of a hyperbolic paraboloid. They thus give a general proof of the well-known rules for the content of truncated prisms, which have triangles or parallelograms for bases.

The area of the section midway between A and B,

$$=\tfrac{1}{2}\left[\left(\frac{b+b'}{2}\right)\left(\frac{p+p'}{2}+\frac{q+q'}{2}\right)\right]$$

Adding together the areas of A and B, and four times the middle area, and multiplying the sum by $\frac{1}{6}\,l$, we obtain,

$$\tfrac{1}{6}\,l\,(b\,p+b\,q+b'p'+b'q'+\tfrac{1}{2}\,b\,p'+\tfrac{1}{2}\,b\,q'+\tfrac{1}{2}\,b'p+\tfrac{1}{2}\,b'q)$$

which can be decomposed into the following:

$$\tfrac{1}{6}\,l\left[(b+\tfrac{1}{2}\,b')\,(p+q)+(b'+\tfrac{1}{2}\,b)\,(p'+q')\right] \quad . \quad (3')$$

This expression is identical with the general formula (3) before obtained.

We thus arrive at the conclusion that *the familiar "Prismoidal formula" can be applied with perfect accuracy to such solids as we have discussed, having one of their faces a warped surface generated as in our first or third hypothesis.*

We have thus far been supposing that the road-bed was horizontal, or, in more general terms, that the base of the solid was perpendicular to its ends. The base may, however, make oblique angles with them. Then, to reduce the solid which we have been discussing to this form, we must take from it a wedge-shaped solid, the breadths of whose ends are b and b', and one of whose depths is zero.

But the prismoidal rule also applies to this wedge, and therefore to the solid which remains after it is taken away from our original solid; since all the areas enter the formula only by addition or subtraction, with a common multiplier.

Again, the solids occurring in excavations and embankments, usually have sloping sides, (as shown by the dotted lines in figures 4 and 5,) instead of the vertical sides which we have used in our investigation.

But the solids to be removed to reduce our original solid to this form, are frusta of pyramids, to which the prismoidal formula also applies, and therefore to the new solid in question; for the reasons given in the preceding paragraph.

We will take as an example an excavation of which A and A′, are cross-sections, 100 feet apart. All the dimensions will be in feet. In section A, fig. 4, let $p=6$ and $q=15$. In section A′, fig. 5, let $p'=18$, and $q'=12$. The sections have the side slopes, 1 to 1, shown by the dotted lines. The bottom width of each=18.

Then, the area of A=279, and that of A′=486. The middle area, obtained from the mean of the outside depths, $(\frac{1}{2}\times(6+18)=12$, and $\frac{1}{2}\times(15+12)=13{\cdot}5)$ is 391·5.

Then the content of the solid by the *prismoidal rule* = 38,850 cubic feet.

The same rule can be applied directly to "*Three-level ground*," *i. e.*, ground given by cross-sections, in which three levels have been taken, viz: one at the centre, and one on each side at the points where the side slopes meet the natural surface. The middle cross-section being obtained

from the mean of the levels at each end, the prismoidal rule can be at once applied.

In the case of "*Irregular cross-sections*," in which the inequalities of the surface of the ground have rendered it necessary to take more than these three levels, the rule will still apply after the following preparation. Conceive a series of vertical planes to pass through all the points on each cross-section, at which the transverse slope of the ground changes, and at which, therefore, levels have been taken, and to cut the other cross-section so as to divide the widths of the two *proportionally*.

Then the surfaces between these planes may be regarded as generated on our third hypothesis, and can therefore be calculated by the prismoidal rule; since it has been shown to apply to the surfaces of the first hypothesis, and these are known to be identical with those of the third. Thus, considering the ground on one side of a centre line, let one cross-section have depths of 6·00 in the centre, and 10·00 outside cutting. Let the other end be 8·00 in centre, 12·00 at four feet from centre, and 6·00 outside cutting. Let the half width of road bed be 10 feet, and side slopes 1 to 1. Then the vertical plane passing through the 12·00 level, at 4 feet, a quarter of the whole width (10+6), from centre, should cut the other section at one-quarter its width (10 + 10), or 5 feet, from centre. The depth at this point would be $6+\frac{1}{4}(10-6)=7{\cdot}00$. This enables us to get a middle area; its depth being $\frac{1}{2}(8+6)$ at centre, $\frac{1}{2}(12+7)$ at $\frac{1}{2}(4+5)$ from centre, and $\frac{1}{2}(6+10)$ at the outside cutting.

The prismoidal rule can now be used. A similar preparation for calculation can be applied to cross-sections composed of any number of levels. The labor is much less in practice than it appears in description.

If the views here presented should meet with general acceptance, engineers would be enabled to economize much time and labor, since they would no longer feel themselves under the necessity of taking their cross-sections so near together that the ground between them should be approximately plane, but could take them as far apart as the ground varied uniformly, no matter how much or how far that might be.

The comparison of the results obtained on this principle, with those given by the usual methods, particularly that of "*Equivalent mean heights*," now usually employed when perfect accuracy is desired, will form the subject of another paper.

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*On the Strength of Pillars of Cast Iron.** By Eaton Hodgkinson, Esq., F. R. S., Professor of the Mechanical Principles of Engineering, University College, London.

In a previous paper on this subject (*Philosophical Transactions*, 1840), I had shown,—1st, that a long circular pillar, with its ends flat, was about three times as strong as a pillar of the same length and diameter with its ends rounded in such a manner that the pressure would pass through the axis, the ends being made to turn easily, but not so small as to be crushed by the weight; 2d, that if a pillar of the same length and dia-

* From the Lond., Edin., and Dub. Philos. Mag., August, 1857.

meter as the preceding had one end rounded and one flat, the strength would be twice as great as that of one with both ends rounded; 3d, if, therefore, three pillars be taken, differing only in the form of their ends, the first having both ends rounded, the second one end rounded and one flat, and the third both ends flat, the strength of these pillars will be as 1—2—3 nearly.

The preceding properties having been arrived at experimentally, are here attempted to be demonstrated, at least approximately.

The pillars referred to in my former paper were cast from Low Moor iron No. 3; they were very numerous, but usually much smaller than those used in the present trials. I felt desirous, too, of using the Low Moor iron in the *hollow* pillars employed on this occasion, not on account of its superior strength, but its other good qualities. The pillars from this iron were cast 10 feet long, and from $2\frac{1}{2}$ to 4 inches diameter, approaching in some degree, as to size, to the smaller ones used in practice. The results from the breaking weights of these were moderately consistent with the formulæ in the former paper, with a slight alteration of the constants, rendered necessary by the castings being of a larger size, and therefore softer than before, a matter which will be adverted to further on.

The formulæ for the strength of a hollow pillar of Low Moor iron No. 2,—where w is the breaking weight, in tons, of a pillar whose length is l in feet, and the external and internal diameters D and d in inches, the ends being flat and well bedded—are as below:

$$w = 46{\cdot}65 \times \frac{D^{3{\cdot}55} - d^{3{\cdot}55}}{l^{1{\cdot}7}},$$

from formula in Phil. Trans. 1840;

$$w = 42{\cdot}347 \times \frac{D^{3{\cdot}5} - d^{3{\cdot}5}}{l^{1{\cdot}63}},$$

from formula in present paper.

To obtain some idea of the relative strength of different British irons, I applied, at Mr. Stephenson's suggestion, to Messrs. Easton and Amos, who procured for me twenty-two solid pillars, each 10 feet long and $2\frac{1}{2}$ inches diameter, cast out of eleven kinds of iron (nine simple irons and two mixtures). The pillars were all from the same model, and were cast vertically in dry sand, and turned flat at the ends, as the hollow ones had been; two being cast from the same kind of iron in each case. The simple unmixed irons tried were as below, and all of No. 1.

		Mean breaking weight.
Old Park iron, ...	Stourbridge, ...	29·50 tons.
Derwent iron, ...	Durham, ...	28·03 "
Portland iron, ...	Tovine, Scotland, ...	27·30 "
Calder iron, ...	Lanarkshire, ...	27·09 "
Level iron, ...	Staffordshire, ...	24·67 "
Coltness iron, ...	Edinburgh, ...	23·52 "
Carron iron, ...	Stirlingshire, ...	23·52 "
Blaenavon iron, ...	South Wales, ...	22·05 "
Old Hill iron, ...	Staffordshire, ...	20·05 "

The mean strength of the pillars from the irons above, varies from 20·05 to 29·50 tons; or as 2 to 3 nearly.

The pillars formed of mixed irons were found to be weaker than the three strongest of the unmixed series.

From many experiments, it was shown that the weight which would crush the pillars, if they were very short, would vary as 5 to 9 nearly.

The pillars in general were broken of four different lengths, 10 feet, 7 feet 6 inches, 6 feet 3 inches, and 5 feet, the ends of all being turned flat, and perpendicular to the axis. It was found that when the length was the same, the strength varied as the 3·5 power of the diameter; and when the diameter was the same and the length varied, the strength was inversely as the 1·63 power of the length. Both of these were obtained from the mean results of many experiments.

The formula for the strength of a solid pillar would therefore be

$$w = m \times \frac{d^{3.5}}{l^{1.63}},$$

where w is the breaking weight, d the diameter in inches, l the length in feet, and m a weight which varied from 49·94 tons in the strongest iron we tried, to 33·60 tons in the weakest.

The ultimate decreement of length, in pillars of various lengths but of the same diameter, varies inversely as the length nearly. Thus the ultimate decreements of pillars 10 feet, 7 feet 6 inches, 6 feet 3 inches, and 5 feet, vary as 2, 3, $3\frac{1}{2}$, and 4 nearly, according to the experiments, from which it appeared that the mean decreement of a 10-feet pillar was ·176 inch.

Irregularity in Cast Iron.—The formulæ arrived at in this paper are on the supposition that the iron of which the pillars are composed is uniform throughout the whole section in every part; but this was not strictly the case in any of the solid pillars experimented upon. They were always found to be softer in the centre than in other parts. To ascertain the difference of strength in the sections of the pillars used, small cylinders $\frac{3}{4}$-inch in diameter and $1\frac{1}{2}$ inches high, were cut from the centre, and from the part between the centre and the circumference, and there was always found to be a difference in the crushing strength of the metal from the two parts, amounting perhaps to about one-sixth. The thin rings of hollow cylinders resisted in a much higher degree than the iron from solid cylinders. As an example, the central part of a solid cylinder of Low Moor iron No. 2, was crushed with 29·65 tons per square inch, and the part nearer to the circumference required 34·59 tons per square inch; cylinders out of a thin shell half an inch thick, of the same iron, required 39·06 tons per square inch; and other cylinders from still thinner shells of the same metal required 50 tons per square inch, or upwards, to crush them.

As these variations in cast iron have been little inquired into, except by myself, and have never, so far as I know, been subjected to computation, I have bestowed considerable trouble upon the matter, in an experimental point of view, and endeavored to introduce into the formulæ previously given, changes which will in some degree include the irregularities observed.

AMERICAN PATENTS.

List of American Patents which issued from September 1st, to September 29th, 1857, (inclusive,) with Exemplifications.

SEPTEMBER 1.

27. For an *Improvement in Sewing Machines;* Orson C. Phelps, Rochester, New York.

Claim.—"Constructing the needle bar of sewing machines with a cap or helmet on its top, and a spring, or other elastic material which is equivalent in its effect, as india rubber, air, &c., interposed between the parts for the purpose of giving a yielding bearing to the thread both in drawing in the stitch, and when the shuttle passes the loop, whereby a very fine thread may be used without breaking, and a better seam produced in consequence of the even tension of the thread, and gradual drawing in of the stitch."

28. For an *Improvement in Gas Regulators;* John H. Powers, Newark, N. J.

Claim.—"The arrangement of the inverted cup-shaped valve and its seat of quicksilver and the lever, which connects the said valve with the pressure cup all within the pressure cup."

29. For an *Improvement in Cotton Seed Planters;* Thomas J. Rogers, Cassville, Georgia.

Claim.—"Forming one side of the eduction aperture of a cotton seed planter of the extremity of a sharply vibrating plate, when the opposite side of said aperture is formed of an adjustable flaring concave."

30. For an *Improvement in Lanterns;* Joseph H. Bohrman, Philadelphia, Penna.

Claim.—"1st, Constructing square frame lanterns with the corner uprights of square wire or metal rods, and the door frame of a single square wire or rod bent in U form, secured at its ends by a strip. 2d, In combination with square wire corner uprights, the peculiar attachment of the guard wires by simple grooves and dove-tailed ends. 3d, Forming tongues in the bottom and top plates, or either, for spring stops to secure the glasses in position, and also for the admission of air necessary to the combustion of the lamp flame."

31. For an *Improved Mode of Adjusting Carriage Tops;* C. W. Saladee, Columbus, Ohio.

Claim.—"Extending the 'top prop' back of the 'rest iron,' a sufficient length to form the lever, in combination with the lateral rod. Also, the scroll spring, in combination with the 'pivot iron' and the back bow (or to either of the other three bows), for the purpose of assisting in raising the top, and likewise to prevent its falling with the full force of its own weight, when in the act of throwing it back."

32. For an *Improvement in Means for Attaching Whiffle-trees to the Tow Lines of Canal Boats;* Andrew Seaman, Amsterdam, New York.

Claim.—"The shaft, with tongue attached, in combination with the bar, with lever attached, the above parts being fitted to the rods."

33. For an *Improvement in Smoothing Irons;* Wm. F. Shaw, Boston, Mass.

Claim.—"Making the flat iron with ascending and descending flues, inlet and discharge openings, arranged in the body of the iron, and so as to be used with a burner and stand."

34. For an *Improvement in Portable Gas Generators;* Warren A. Smith, Boston, Massachusetts.

Claim.—"The tubular retorts for the manufacture of oil gas."

35. For an *Improvement in Instruments for Drawing the Curve of Circular Stair Railings;* George S. Stewart, Meadville, Pennsylvania.

Claim.—"The construction of a machine with an adjustable table, and the graduated

post and arm, adjusted with the set screws and the semi-circle, or any other substantially the same, which will produce the same result."

36. For an *Improved Apparatus for Suspending Eaves-troughs;* James A. Waltrous, Green Spring, Ohio.

Claim.—"The employment of a metal strap, in combination with cross-bar and the slotted plate, for securing and readily adjusting eave-troughs."

37. For an *Improved Machine for Planing Saw Teeth;* John N. Wilkins, Waukegan, Illinois.

Claim.—"The two planers or cutters fitted within the case, and operated in combination with the guide or cross-piece within the case, the whole being arranged and applied to the saw."

38. For an *Improved Machine for Forging Metals;* Elbridge Wheeler, Feltonville, Massachusetts.

Claim.—"Operating the roll at stated intervals by means of cams and levers, or their equivalents, whereby I am enabled to roll a piece or bar of metal to a given pattern."

39. For an *Improvement in Pipe Coupling;* Elizur Wright, Boston, Mass.

Claim.—"The use of a compressible packing ring inserted in a groove around the pipe on each side of the joint, in combination with screw threaded or flanched and bolted couplings, and a thimble for holding the packing ring in the grooves, so as to form a water-tight joint, and resist separation by the packing ring serving as a dowel."

40. For an *Improvement in Percussion Cap Primers;* George W. Baker, Burlington, Vermont.

Claim.—"The percussion cap primer whose improvement consists in the peculiar construction which enables one side of the case of said primer to serve as an elastic cap retainer at the side of the outlet of said case."

41. For an *Improved Mode of Moving Stores, &c., in case of Fire;* Asa Blood, Sen., Norfolk, Virginia, and Robert W. Brown, Washington, D. C.

Claim.—"The manner for moving the adjustable stalls by means of the lever, rod, and clinch, on rollers and track."

42. For an *Improved Mode of Attaching Scythes to Snaths;* Oliver Clark, Henrietta, Assignor to Aaron H. Pinney, Columbus, Ohio.

Claim.—"The metallic block, in combination with stirrup bolt, collar, and scythe heel."

43. For an *Improved Sliding Rest for Lathes;* Eleazar S. Gardiner, Assignor to Smith, Gould & Co., Philadelphia, Pennsylvania.

Claim.—"The revolving collar, with its square eye, when the same is employed in conjunction with the steady rest of a turning lathe, for which a patent was granted to Albin Warth, on the 10th day of October, 1854."

44. For an *Improved Machine for Crozing and Chamfering Staves;* Henry L. McNish, Assignor to self and David C. Butler, Lowell, Massachusetts.

Claim.—"The self opening and closing clamp, or its equivalent, so geared to other parts of the machine, as to operate periodically corresponding with the motion of the feed rollers. Also, making the clamps adjustable to croze staves of barrels of different diameters."

45. For an *Improvement in Condensers for List Speeders;* William Mattison, Assignor to John C. Whitin, Northbridge, Massachusetts.

Claim.—"The self-adjusting weight or condenser, applied and retained in its position by the casing or bonnet, or its equivalent."

46. For an *Improvement in Head Rests for Railroad Car Seats;* Wm. M. McCauley, Assignor to J. N. McIntire, Washington, D. C.

Claim.—"Pivoting the rocker or shank of the head plate in the stationary holder, in combination with the segmental spring, whereby the head plate accommodates itself to any inclination of the head and forms a springing or elastic support."

47. For an *Improvement in Carding Engines;* Horatio N. Gambill and Singleton F. Burgee, Woodbury, Maryland; patented in England April 14, 1857.

Claim.—"Delivering the cotton on to the main cylinder always at two and sometimes at three different points or places, whilst using but one set of feeding rollers. Also, the combination of the working cylinders, and the working and stripping cylinder, all running in the same direction, and working in connexion with each other, and with the main cylinder, the two first delivering the cotton to the main cylinder regularly, whilst the latter is doing so at intervals. Also, mixing the strippings taken from the main cylinder by the stripping cylinder, with the cotton on the cylinder, carding it, and returning it thus mixed and carded to the main cylinder. Also, in combination with the cylinders, the stationary casing, and the concave for separating the dirt from the cotton, whilst undergoing the carding process. Also, in contradistinction from giving the variable motion to the cylinder of cone pulleys and a traveling belt attached to each carding engine, the giving of said motion to a shaft or line of shafting, and imparting it from said shafting to the engine by simple belt and pulleys, by which means more certain action is had and at less expense."

48. For an *Improvement in Casting Bearings in Iron Wheels;* Charles Taylor, Little Falls, New York.

Claim.—"The employment of the bevel or oval cap piece, or its equivalent, when it is used in connexion with pins, or their equivalents."

49. For an *Improved Socket-Coupling for Lathes;* George N. Towbridge, Lowell, Massachusetts.

Claim.—"The combination of the spring and pin with the conical shank and socket, with straight screw attached."

SEPTEMBER 8.

50. For an *Improvement in Coal Sifters;* Sanford Adams, Boston, Massachusetts.

"My invention consists in the manner of supporting the sieve so as to be rotated, or partly rotated, within the box or barrel to which it is applied."

Claim.—"Attaching the sieve to the bottom of the rotating spindle, and the spindle to the cover of a barrel."

51. For an *Improvement in Seed Planters;* Cyrus C. Aldrich, Faribault, Minnesota.

"This invention relates to an improvement in that class of seed planting machines, in which the seed or grain is discharged from the peripheries of the wheels on which the device is mounted."

Claim.—"The box provided with the plunger, when said plunger is operated by the lever frame."

52. For an *Improvement in Corn Planters;* D. R. Alden, Unionville, Ohio.

Claim.—"Operating or rotating the wheel by means of the belt, having knobs attached, and the wiper wheel attached to the shaft of the wheel."

53. For an *Improvement in Corn Planters;* Horace R. Allen, Athens, Ohio.

Claim.—"The lever, pins, scraper, spring, and rake, and in combination with the spout and valve."

54. For an *Improvement in Tubes for Steam Pressure Gauges;* E. H. Ashcroft, Boston, Massachusetts.

Claim.—"The tube formed by incasing one tube within another."

55. For an *Improved Machine for Cutting Figures out of Sheet Metal;* C. P. S. Betts, City of New York.

Claim.—"The combination of the blade or shear with the stationary blade or bed shear, whereby the said shear or blade, acting against the shear or blade, first perforates and then cuts the sheet of metal or other material; and this I claim whether the shear or blade be made stationary or adjustable for varying the cutting angle."

56. For an *Improvement in Insulated Telegraphic Wires Inclosed in Metallic Tubing;* Samuel C. Bishop, City of New York.

Claim.—"A new manufacture, consisting of wire insulated by a covering of gutta percha or india rubber, firmly inclosed in a coating of lead or other ductile metal."

57. For an *Improvement in Reversible Railroad Car Coupling;* Joseph Boothroyd, Michigan City, Indiana.

Claim.—"The device by which my couplings revolve, so as to present either a bell mouth or a link, and at the same time admit of all necessary play to accommodate the motion of the cars."

58. For an *Improvement in Processes for Manufacturing Verdigris;* Ludwig Brumlen, Hoboken, New Jersey.

Claim.—"1st, To use all these refuse liquids from chrome yellow and white lead to make verdigris of them. 2d, To use the remaining liquid from verdigris to make Paris green of. 3d, To use the remaining liquid from Paris green again, for making chrome yellow. 4th, To use the refuse liquid from verdigris again for verdigris. 5th, The manufacture of verdigris, Paris green, and chrome yellow, from the different waste liquids."

59. For an *Improvement in Gas Retorts;* Saunders Coates, City of New York.

Claim.—"Forming a false bottom for gas retorts from metal of dissimilar degrees of fusibility, viz: one such as lead in combination with one such as iron, resting upon the easily fusible metal."

60. For an *Improved Wrench;* H. M. Clark, New Britain, Connecticut.

Claim.—"The combination with a hook or claw griper hinged to the permanent stock, and acted on by a spring, of a sliding rag jaw, having a screw adjustment on or along the permanent stock for joint and independent action."

61. For an *Improvement in Vapor Lamps;* Joseph G. Gilbert, City of New York.

Claim.—"The combination of the sulphur and cork."

62. For an *Improvement in Metallic Packing for Pistons of Steam Engines;* George H. Corliss, Providence, Rhode Island.

Claim.—"The arrangement within a piston of the cylindrical springs."

63. For an *Improved Machine for Drying Grain, &c.;* Christian Custer, Philadelphia, Pennsylvania.

Claim.—"The rotating and vertically reciprocating drying chamber, formed of the series of vessels or pans and guide plates placed on the shaft, in combination with the furnace, drum, and hot air chamber, the above parts being arranged relatively with each other."

64. For an *Improved Mode of Tightening Tires of Carriage Wheels;* James M. Dick, Buffalo, New York.

Claim.—"The combination of the wedge and bolt, or their equivalents, with the felloes and tire."

65. For an *Improvement in Corn Shellers;* Andrew Dillman, Plainfield, Illinois.

Claim.—"In combination with an inclined trunk, the inclined carrying apron or belt with its lags."

66. For an *Improvement in Seed Planters;* I. W. Ells and James Charlton, Pittsburgh, Pennsylvania.

Claim.—"The combination and arrangement of the reciprocating feed slide, with the cut-off slats and the brush."

67. For an *Improvement in Mowing Machines;* George C. Dolph, West Andover, Ohio.

Claim.—"The lever, link, sliding box, and guides, with the adjusting wrist, and in relation to an adjustable cutter bar."

68. For an *Improvement in Cartridges for Breech Loading Fire Arms;* J. Durell Greene, Cambridge, Massachusetts.

Claim.—"The cartridge having the ball behind the powder, and a wad behind the ball."

69. For an *Improved Machine for Ramming Under the Cross-ties of Railroads;* Richard B. Harrison, Vicksburgh, Mississippi.

Claim.—"My movable machine for ramming earthy matter under the cross-ties of

railroads, said machine being composed of reciprocating rams and suitable actuating levers combined with a platform car."

70. For an *Improvement in Hand Seed Planters;* Joel Haines, West Middleburg, Ohio.

Claim.—"The opening through the standard, or its equivalent, so arranged as to form a bar or scraper to clear the earth or wet earth from the plunger as it is pushed down, and deliver it out through the opening, whether the upper edge of the scraper is curved or otherwise."

71. For an *Improvement in Straw Cutters;* Porter Hill and Charles E. Jones, Millport, New York.

Claim.—"1st, The combination of the rotating knife or cutting disk, with the series of revolving chambers arranged around a central shaft or axis, in such a manner that the revolutions of the same shall bring the straw in each successively between the edge of the knife and periphery of the chambers. 2d, The manner of feeding the straw to the knife by means of the eccentric, the permanent and movable ratchet bars, and dogs so arranged as to crowd the straw forward only when the chamber, by descending, is clear of the action of the knife, and also be capable of adjustment to different degrees of feed."

72. For an *Improvement in Attaching Wires to Bell Telegraphs;* Henry Hochstrasser, Philadelphia, Pennsylvania.

Claim.—"The intermediate spring, or its equivalent."

73. For an *Improvement in Corn Planters;* D. W. Hughes, New London, Missouri.

Claim.—"Connecting the two implements together by means of the plates, and bars, and pendent bar."

74. For an *Improvement in Machines for Punching Paper Fillets for Transmitting Telegraphic Signals;* John P. Humaston, New Haven, Connecticut.

Claim.—"1st, The manner of operating the punches for perforating the characters in the paper, consisting of the revolving type-wheel, or other equivalent means of indicating characters, in combination with the punches. 2d, The method of regulating the feed of paper, consisting of the graduated stop-wheel, or equivalent series of stops, in combination with the type-wheel, and with the means for propelling the paper fillet past the punches. 3d, The manner of forming the cutting ends of the punches, that is to say, having its advancing end formed into two cutting edges by means of the V shaped recess, in combination with a second pair of cutting edges opposite to them, formed in like manner and upon the same plate, but in position at a right angle to the first pair, thus making the other half of the shear, in conjunction with an adjoining punch."

75. For an *Improvement in Automatic Railroad Car Brake;* W. R. Jackson, Baltimore, Maryland.

"This invention consists in the mode of arranging the actuating parts of the brake, so that when the car is being drawn forward, the brakes shall be thrown out of action and leave the wheels free to revolve; but when the tractive force ceases to be applied, the brakes will instantly be brought into action, and check the speed of the train or vehicle."

Claim.—"The mode of controlling the action of the spring or springs, which bring the brake blocks to bear upon the tread of the wheels by the operation of the tractive force, or its suspension, so that the wheel shall be free when the vehicle is being drawn forward or backed, and the brakes applied by the momentum of the train, when the tractive or backing force is withdrawn."

76. For an *Improvement in Sheep Shearing Machines;* J. V. Jenkins, Jackson, Michigan.

Claim.—"Connecting together the two shafts, and also the shaft to the cam shaft by universal joints, the connecting joint of the shaft being provided with guards, and connecting the upper end of the shaft by a joint to the slide on the swinging bar."

77. For an *Improvement in Machines for Lasting Boots and Shoes;* John Kimball, Boston, Massachusetts.

Claim.—"Combining the toe-rest and its clamp to the attachment plate by means of an inclined rod, so that both may be moved together, in order at one and the same time to clamp the upper to the toe of the last, and move the toe-rest towards the heel post."

78. For an *Improved Wear Iron for Carriages;* I. George Sefter, Philadelphia, Pa.

Claim.—"The peculiar construction of the metallic recess guards, with the flanches bearing against the bottom and sides of the body of a plain carriage or wagon, and arranged with the latter."

79. For an *Improved Bolt for Safes;* Stuart Perry, Newport, New York.

Claim.—"So combining a safety bolt with the lock of a bank, vault, store, or other door, through the means of a bar or trigger, as that the forcing of the lock by any means from the door, shall trip or release the safety bolt, and allow it to securely fasten or lock said door."

80. For an *Improvement in Scythe Snaths;* Abner H. Pinney, Columbus, Ohio.

Claim.—"Uniting the two pieces by a branched ferule for the purpose of making a scythe snath that shall have the proper form without being bent into that shape, and the necessary strength and rigidity to make it an economical implement."

81. For an *Improvement in Signals for Steamboats;* Albert Potts, Philadelphia, Pennsylvania.

Claim.—"The system of signals for steamers, formed by lights mounted upon movable cranes, and rotated from the paddle wheel or propeller shaft."

82. For an *Improvement in Wash Mixtures for Woolens, &c.;* Wm. Reisig, Astoria, New York.

Claim.—"An aqueous saponaceous composition, with the alkalies in excess."

83. For an *Improved Mortising Chisel;* John A. Scroggs, Burlington, Vermont.

"My invention consists in constructing a mortising chisel, in such a manner that the chip formed by the forward movement of said chisel will be thrown out of the mortise by the reverse movement of the same."

Claim.—"My improved self-clearing mortising chisel, whose peculiarity consists mainly of its oblique grooves."

84. For an *Improvement in Locks;* John P. Sherwood, Fort Edward, New York.

Claim.—"The improvement in locks produced by so shaping and arranging the bolt and the tumbler of a lock, that the said tumbler is enabled to retain the bolt within reach of the arms on the knob shank follower, when it is used as a spring latch bolt, and also retain the said bolt in a position beyond the reach of said arms, when it is thrown outwards by the key into a position to serve as a lock bolt. Also, as the second feature of my invention, the combination of the lever shank with the tubular pivot and the tumbler, in such a manner that it may be made to firmly lock the tumbler in such a position as to protect the bolt from any action of the key, and thereby prevent the locking or unlocking of the bolt."

85. For an *Improvement in Grinding Mills;* Wm. Stauffer, Middlebury, Indiana.

Claim.—"The combination and arrangement of the arm with the arm, and the sliding rod together, with the cam on the shaft, the beam, the rod, the weight, and the connecting beam, for the purpose of arresting the motion of the mill. Also, the arrangement of the cord with the shaft and the springs, for the purpose of ringing the bell to notify the attendant when the grain is nearly run out of the hopper."

86. For an *Improved Door Spring;* Edward P. Torrey and Wm. B. Tilton, City of New York.

"The object of our invention is to render practicable and useful the adjusting bracket of the upright torsional rod spring, contrived by T. Riggin, said bracket consisting of a turning socket with a flanch at its upper end, in which flanch a series of adjusting holes are formed."

Claim.—"The arrangement of the adjusting cog-wheel between the two notched

ears of the bracket, and the pivoted stop plate on the face of the bracket, and in such relation to said cog-wheel and the notches in the ears, that the whole operating together will form a firm and substantial adjusting device for the upright torsional rod spring."

87. For an *Improvement in Churns;* Daniel E. True, Lake Village, New Hampshire.

"This invention consists in providing the rocking or other churns having a similar operation, with a separator, for the purpose of dividing the cream into two separate currents, and allowing them to come in contact alternately."

Claim.—"The employment (in the rocking and other churns of similar operation,) of a separator."

88. For an *Improvement in Brick Machines;* Stephen Ustick, Philadelphia, Pa.

Claim.—"The oscillating filling box with projections at its ends, in combination with the condensing mould having depressions at its ends, when said parts are constructed and arranged to operate in relation to each other, and in connexion with the pistons."

89. For an *Improvement in Blast Furnace;* Samuel Wilkes, Hammondsville, Ohio.

Claim.—"The introduction and application of steam in blast furnaces at the boshes, whether at one or more points."

90. For an *Improvement in Washing Machines;* Philip N. Woliston, Springfield, Ohio.

Claim.—"The auxiliary rubber disk, in combination with the disk provided with cleats or rubbers on both sides, and the cleats on the bottom of the tub."

91. For an *Improved Padlock;* Linus Yale, Newport, New York.

"This invention consists in attaching two pieces of metal together by a tongue and groove, in such a manner that by sliding back and forth they will open and close a suitable hole to receive the staple."

Claim.—"The use of the tongued and grooved sliding joint, operating in concert with the jointed stops."

92. For an *Improved Method of Manufacturing Wooden Wash-boards;* L. B. Batcheller, Assignor to West, Canfield & Co., Arlington, Vermont.

Claim.—"The machine."

93. For an *Improvement in Saccharine Evaporators;* Joseph Bour, Forbach, France, Assignor to Charles Parlange, Parish of Point Coupie, Louisiana.

Claim.—"The combination of a series of hollow vessels, with apparatus on the interior thereof for raising the water to and passing it off by the central axis, and the further combination of such like surface, with vessels or apparatus for raising the liquid to be evaporated, and distributing the same over the exterior of the revolving surfaces."

94. For an *Improvement in Harvesters;* C. M. Sufkin, Assignor to Norris Sufkin, Unity, New Hampshire.

Claim.—"The combination of the cutters, cord, with the peculiarly constructed plate."

95. For an *Improvement in Cultivator Teeth;* Edmund L. Freeman, Brownville, Assignor to self, and J. and G. Lord & Co., Watertown, New York.

Claim.—"A lapped-headed cultivator tooth. Also, a brace washer and stay-pin, in one piece, underneath the head."

96. For an *Improvement in Machines for Pegging Boots and Shoes;* Seth D. Tripp, Winchester, Assignor to self and Luther Hill, Stoneham, Massachusetts.

Claim.—"1st, In machines for pegging boots and shoes (when the gate which carries the awl and driver is allowed to swing freely in a plane perpendicular to the surface of the sole, or nearly so,) is the arrangement and combination of the spring, the disks, lever with its toggle-joint and connecting rod, and the lever, for the purpose of bringing down, clamping, and releasing the gate. 2d, The feeding pawl with its spring and slot, in combination with the holding pawl or bolt, whereby the amount of feed of the carriage is regulated, and the latter is held stationary. 3d, Regulating the motion of the carriage by means of the combination of the following devices, or their substantial

equivalents, viz: the groove, pin, dogs, stops, blocks, and guide. 4th, The combination of the devices employed for the purpose of cutting off a portion of the pegs, and for adjusting the throw of the awl and driver to correspond therewith, or their substantial equivalents, whereby the awl and pegs are prevented from penetrating the last. 5th, The offsets upon the slides for the purpose of causing the driver to descend over the hole made by the awl."

97. For an *Improvement in Extension Gas Tubes;* Charles Monson, New Haven, Connecticut.

Claim.—"The combination of levers and tube or tubes. Also, the use and application to a gas tube of jointed extension levers. Also, the use and application thereof, as an instrument for extending the reach, and contracting the reach of a gas tube, or of gas tubes, of whatever form, and for holding and guiding the same. And, finally, the use of said levers as an instrument for relieving or preventing the strain of traction or of weight upon said gas tube, and upon the joints thereof."

98. For an *Improved Sash Lock;* Wm. Patton, Towanda, Pennsylvania.

"This invention consists in the independent hook and lock upon the same axle, so that they may be changed to form a right or left hand-catch as may be desired."

Claim.—"In combination with the single axle, the self-locking hook, and self-acting double hook fastener, so arranged as to act independently of each other, and so that they may be shifted on said axle to form a right or left hand-catch."

99. For an *Improved Machine for Forging Nuts;* Edward Pay and Samuel Hall, City of New York.

Claim.—"The hammering apparatus, in combination with the punch, and the punch arranged and operating for making nuts."

SEPTEMBER 15.

100. For an *Improvement in Machines for Hulling Rice;* Wilson Ager, Rhorsburg, Pennsylvania.

Claim.—"Removing the rice husk by pressure in direction of the length of the grain, effected by the action of a shell and burr."

101. For an *Improvement in Machines for Cleaning Rice;* Wilson Ager, Rhorsburg, Pennsylvania.

Claim.—"The method of cleaning rice by submitting the mixture of grain and husk resulting from the hulling process, to an alternate packing and loosening action."

102. For an *Improvement in Grinding Mill;* Aaron Arnold, Troy, New York.

"This invention relates to the grinding apparatus of the mill, and consists in the cut or sectional cone, and in connexion therewith, the disk, and their arrangement on the shaft, so as to be readily removed and replaced by others when worn out."

Claim.—"The combination of the rotating disk or plate, and cut or sectional cone, with the interior of the concave and flanch, for the purpose of feeding in to the mill, and grinding large substances, such as corn on the cob. Also, securing the cone and disk or plate to the shaft, through the intervention of the face plate, so that said cone and disk may at any time be removed and replaced by others, when they become dull or worn away."

103. For an *Improvement in Flour Bolt;* N. Baumann, Elmore, Illinois.

Claim.—"The shell or case, curved or formed, in combination with the rotating beaters and frame, with bolting cloth attached."

104. For an *Improvement in Machines for Kneading Dough;* Hiram Berdan, City of New York.

Claim.—"The employment in a kneading machine of a hopper."

105. For an *Improvement in Machines for Hardening Hat Bodies;* Joseph Booth, Newark, New Jersey.

Claim.—"A hardening machine consisting substantially of a cradle and of a rapidly revolving spindle, upon which the cradle is supported eccentrically."

106. For an *Improved Mode of Sustaining Window Sash;* Edward T. Briggs, Salem, Massachusetts.

"This invention consists in providing the sash with a metal strip to slide in an angular grooved support, operated upon by a spring, and causing a friction sufficient to sustain the sash at any desired height it may be placed."

Claim.—"Furnishing the sash with the metal strip, in combination with the angular grooved support and spring."

107. For an *Improvement in India Rubber Paint;* William and William A. Butcher, Philadelphia, Pennsylvania.

Claim.—"The composition prepared and composed of the materials, for the purpose of making water-proof paint."

108. For an *Improvement in Gas Generators;* John Butler, Brooklyn, New York.

Claim.—"Generating illuminating gas in a retort over the surface of melted lead or other fusible metal."

109. For an *Improvement in Excavators;* Ze Butt, Lincolntown, North Carolina.

Claim.—"The attaching the posts, in combination with the cross-bar resting upon the frame, to the scoop itself by pivots or otherwise, for the purpose of bearing and supporting it whilst loading and regulating the depth it is to enter the ground, and for taking the strain off the chains and windlass. Also, the elevation of the loaded excavator by horse-power, or any other method substantially the same. Likewise, the arrangement and combination of the gate catch rod and lever, so that the gate can be opened and closed by the driver, without his leaving his seat."

110. For an *Improvement in Mastic Roofing;* Wm. H. Carver, Covington, Kentucky, and J. Beckley, Cincinnati, Ohio.

Claim.—"The precise manner employed of mixing and compounding the ingredients, and applying the cement when combined with the proportions of ingredients, by which process of mixing and compounding, and combination of ingredients, and applying the cement to use, we are enabled to decompose or destroy the ammonia contained in the coal tar, to prevent it from destroying the cement and eating the canvass on which it is spread, and at the same time produce a cement that is not brittle and subject to cracking, but hard enough to resist forces that roofs are generally subject to, and at the same time elastic enough to expand and contract to suit all conditions of heat and cold, and make the cement water-proof."

111. For an *Improvement in Mowing Machines;* A. H. Caryl, Sandusky, Ohio.

Claim.—"The combination of the rear portion of the tongue or hounds with the main or wheel frame and seat, said parts being arranged for joint operation."

112. For an *Improved Raking Attachment for Reaping Machines;* A. H. Caryl, Sandusky, Ohio.

Claim.—"1st, Raising the rake in the plane in which it is inclined. 2d, Operating the raking attachment back and forth over the platform, by means of the mechanism. 3d, Inclining the rake from a vertical plane to correspond with the length of the grain being cut."

113. For an *Improvement in Invalid Beds;* George H. Clark, Pontiac, Michigan.

Claim.—"The construction and arrangement of parts, by which the head end of the foot portion of the bed is made capable of being lowered away from the patient. Also, combining with said arrangement the slide attached to the frame to support the vessel."

114. For an *Improvement in Making Paper Pulp from Ivory;* Wm. N. Clark, Chester, Connecticut.

Claim.—"The using of ivory as stock to make pulp for the manufacture of paper."

115. For an *Improvement in Hanging Mill Stones;* Edwin Clark, Lancaster, Pa.

Claim.—"So uniting the rim which supports the upper stone to the frame of the mill, by sliding blocks or followers, as to allow an upward play or automatic adjustment of the upper stone, and at the same time admit the usual hand adjustment by set screws if desired."

116. For an *Improvement in Ships' Pumps;* Abraham Coates, City of New York, and Samuel M. Perry, Brooklyn, New York.

Claim.—"The peculiar mechanism by which we obtain reciprocating motion between the pump and piston, from each move of a lever having a combined horizontal and longitudinal motion, the same consisting of the shaft, the cross through which it passes, the universally moving lever attached by journals to the cross at right angles to the shaft, and the two bevel gears or section of gears, the one attached to the lever, the other to the shaft, or any other arrangement substantially the same."

117. For an *Improved Socket for Bolts;* H. W. Collender, City of New York.

Claim.—"Having a disk or follower placed within the socket and connected with a spring, arranged in any proper way, so that as the bolt is withdrawn from the socket, the spring will press the disk or follower against the upper or outer end of the socket, and close the orifice thereof."

118. For an *Improved Machine for Expanding Spectacle Bows;* George N. Cummings, Hartford, Connecticut.

Claim.—"The spectacle eye former, made in two parts, the circumference of the two parts when closed being smaller than the eye, and being expanded by the double former to the required size."

119. For an *Improvement in Street Sweeping Machines;* John Critcherson, Boston, Massachusetts.

Claim.—"The improvement in street sweeping machines, which consists in the combination of the adjustable sliding bars traveling in the arc of a circle with the universal joints for driving the diverging shafts upon which the bushes are arranged, whereby the sweeping apparatus is adapted to streets of various widths."

120. For an *Improvement in Bridges;* Charles H. Earle, Green Bay, Wisconsin.

Claim.—"The supporting of those ends of the several sections of the bridge which are not connected directly with the abutments, by attaching them to cap pieces, or their equivalents, fitted to rise and descend on piers, in combination with the attachment of the sections next the abutments with knuckles or hinges, whereby the bridge is rendered self-adjusting, and prevented being carried away by accumulations of ice, floods, or other causes leading to lift the bridge from its place."

121. For an *Improvement in Operating Valves of Steam Engines;* Robert H. Fletcher, Brooklyn, New York.

Claim.—"The arrangement of the slide valve with the pistons and valves, with their respective steam ways operating together."

122. For an *Improved Painters' Easels;* George Gillett, Little York, New York.

Claim.—"The combination of the three motions obtained by the two semi-circles, and the rotary motion of the standard, together with the latches and notches in the semi-circles to retain the position, and also as an application to the easel or painting stand."

123. For an *Improvement in Safety Fuse Compositions;* Edwin Gonez and Wm. Mills, City of New York.

Claim.—"The explosive compound for safety trains, fuses, and similar purposes, formed of the ingredients."

124. For an *Improved Mode of Operating Window Sash;* John C. Grant, Salem, Mass.

Claim.—"Combining with the window frame and sash, the rack, gears, pulleys, and spring."

125. For an *Improvement in Coolers for Breweries;* Adolph Hammer, Reading, Pa.

Claim.—"The application thereto of the movable partitions rendered stationary."

126. For an *Improvement in Feathering Paddle-wheels;* Lewis T. Howard, Smith's Mills, Mississippi.

Claim.—"Contracting the hub of the paddle-wheel so as to dispense with an outside bearing, for the purpose of enabling me to place the feathering-wheel outside of the paddle-wheel, and use any length of connecting arms between said feathering-wheel and the buckets that may be deemed most effective."

127. For an *Improvement in Treating Cotton and Linen Waste;* Eben Norton Horsford, Cambridge, Massachusetts.

Claim.—"The use of acid to dissolve metallic particles in cotton and linen factory waste."

128. For an *Improved Method of Treating Fibrous and Textile Substances in a Vacuum for Cleansing purposes;* Julius A. Jillson, Poughkeepsie, New York, and Henry Whinfield, City of New York.

Claim.—"The process of treating fibrous and textile substances in a permanent vacuum for extracting coloring grease, or other foreign matter."

129. For an *Improved Machine for Pointing Wire;* C. Jillson, Worcester, Mass.

Claim.—"Causing the wire that is being pointed to force the cutter away from the point that is being cut, but in forcing it away, controlled by a pattern which regulates the form and the taper given to the wire."

130. For an *Improved Belt Tool;* David A. J. Lamson, Cherry Valley, Mass.

Claim.—"The combination of the several tools in one instrument."

131. For an *Improved Spoke Machine;* Samuel Lord, Perry, Georgia.

Claim.—"The vibrating frame, operated and arranged with the carriage and saw, so as to operate conjointly."

132. For an *Improvement in Harness for Looms;* George Matoon, Chickopee Falls, Massachusetts.

Claim.—"The mode of making a harness so that its lease and knot shall be below its eye, and the threads of each loop be caused to pass against one side of their shaft or bar, instead of being caused to embrace opposite sides of it, namely, first knitting the harness with a lease at top and one at bottom, or one above, as well as one below each eye, and subsequently changing the upper shaft so as to pass it between the several loop threads of the upper side of the harness, in such manner as to make both threads of each loop pass against one side of the shaft."

133. For a *Composition for Preparing Tracing Muslin;* Jesse K. Park, Marlborough, New York.

Claim.—"The employment of the oil of the palma christi, or castor oil, alone or as an ingredient in a composition for increasing the transparency of tracing muslin."

134. For an *Improved Method of Regulating the Velocity of Wind-wheels;* Francis Peabody, Salem, Massachusetts.

Claim.—"An improvement in regulating the action of wheels."

135. For an *Improvement in Valve Gears for Oscillating Steam Engines;* John C. Pennington, Paterson, New Jersey.

Claim.—"A valve gear for an oscillating steam engine composed of an eccentric and a slotted arc, the curve in which is concave towards the shaft, and provided with a sliding pin which is connected with the valve, or the equivalents thereof, and this I claim whether the slot be long enough for reversal, or of such length as may be sufficient for running the engine in one direction only."

136. For an *Improved Tenoning Machine;* Perry Putnam and John E. Crane, Lowell, Massachusetts.

Claim.—"We do not claim the parts of our machine separately, but their arrangement and operation specifically."

137. For an *Improvement in Watch-makers' Lathe;* Boswell H. St. John, Bellefontaine, Ohio.

Claim.—"The construction of the chuck, formed of the jamb disk, the tubular clutch collar or ward brush, with the centering plate and adjustable jaws together, combined with a keying mandrel."

138. For an *Improvement in Boxes for Preserving Alkalies;* George Thompson, East Tarentum, Pennsylvania.

Claim.—"The use of metallic boxes, constructed and united with infusible cement,

for the purpose of putting up the caustic alkalies of soda and potassa in small quantities,"

139. For an *Improvement in Drip Pots for Sugar Houses;* John Turl, City of New York.

Claim.—"Constructing the pot of two metal parts or halves formed or 'stuck-up,' in proper shape by any proper means, and connected together by rivets, by brazing, or in any suitable way."

140. For an *Improvement in Illuminating Gas Apparatus;* Charles B. Warring, Poughkeepsie, New York.

Claim.—"1st, The eye-piece and tube in combination. 2d, The peculiar apparatus for conveying the gas into the gas holder."

141. For an *Improvement in Ball Cartridges;* Lemuel Wells, Astoria, New York.

"This invention consists in making the shell of a ball cartridge of a piece of hard metal tube, fitting into a seat swaged, or otherwise, prepared to receive it inside the bullet, by which construction several advantages are obtained."

Claim.—"The attachment of the hard metal shell of a ball cartridge to the bullet, by making it smaller than the bullet, and driving it into a cavity in the rear of the bullet."

142. For an *Improvement in Diaphragms for Photographic Cameras;* J. Robert Werner, City of New York.

Claim.—"The application of an elastic diaphragm in photographic cameras."

143. For an *Improvement in Brewers' Coolers;* Adam Wood, Pittsburgh, Penna.

Claim.—"Constructing the coolers in two parts, corrugated and placed in contact, so that cold water or air passages are formed between said bottoms, and the bottoms allowed to expand and contract freely without injury, by which the bottom of the liquor within the cooler may be cooled as quickly as the top, or the heat rapidly absorbed from both surfaces, and the cooling of the whole mass or quantity therefore greatly expedited."

144. For an *Improved Raking Attachment for Reaping Machines;* Christian Yost, Leacock, Pennsylvania.

"This invention is giving the rake a downward and quick motion as it reaches the platform by means of mechanism constructed and arranged in a peculiar manner."

Claim.—"Operating the rake by means of the device, the regulator, in combination with the semi-cog-wheels and pins."

145. For an *Improved Type-setting and Distributing Machine;* Timothy Alden, City of New York.

"My invention of improvements in type-setting and distributing, consists in a machine partly automatical in the operation, and partly operated by the action of an attachment. The purely automatical part lies in the type-distributing operation, while the setting of type is governed by the attendant. Both setting and distributing may be going on at the same time, or separately."

Claim.—"1st, The method for conveying the type to and from the type cases, and the composing and setting tables, consisting of a type-carrier, in combination with a series of conveyers, which are capable of receiving any type indiscriminately, and also of receiving an indication representing the type so received, or that required, whereby that type may be deposited into, or taken from, the type cases. 2d, The method of attaching the conveyers to the carrier, by which they are permitted to stop while delivering or receiving type without arresting the motion of said carrier. 3d, Giving to the conveyer a vibrating or tilting motion upon its central pin, whereby its gripping end is made to closely approach the place at which the conveyer is to receive or deposit a type. 4th, In combination with the devices or mechanism for receiving and for delivering the types into, and from, the type cases, or their equivalents, arranging the types edgewise in said cases, whereby for all the types of a font, an uniform throw or action may be given to said mechanism. 5th, In combination with the type channels, the mechanism for pushing out the type, consisting of the rack, pendulum, lever, and propelling rod, and the pusher upon the conveyers, or any equivalents thereof. 6th, In combination

with the type channels, the mechanism for preventing the stopping of a setting conveyer at a type channel when it is empty, or a distributing conveyer at a channel when full of type, consisting of the tilting bar, the pendulum, lever, and rack, or equivalents. 7th, The method of discharging the type from a distributing conveyer into the type channels, or of causing it to be received from such channel into a setting conveyer, consisting of the cam and the pusher-plate, or equivalents thereof. 8th, The mechanism for setting the gripping bolt upon the conveyers, and for releasing the same, consisting of the stationary cam and crank lever, for the setting of said bolt, and for the releasing thereof of the latch and cam or pin. 9th, The method of effecting or insuring the deposit of each type into, or the taking thereof from, an appropriate case, consisting of the excavated ring, or any equivalent thereof, which shall have upon it, at or near each type case, a device indicative of the denomination of the type contained in said case, and which device shall cause, at the proper place, an action of the conveyer to receive or to deposit a type as the case may be, in accordance with any given set upon the conveyer. 10th, The stationary inclined pieces, in combination with the grooves of the ring, for restoring the indicating points upon the conveyer to a zero or starting point. 11th, The movable indicators, or their equivalents, in combination with the grooves in the ring, and with the shifting bars of the distributing mechanism. 12th, The method of setting the distributing indicators by means of the system of levers, or equivalent mechanism, so constructed and operated as to be acted upon by a system of nicks upon the type, by which certain parts are allowed to be brought into operation to move the indicators in accordance with the plan or combination of nicks, and whereby the appropriate case or place of deposit of type is indicated upon the conveyers. 13th, The graduated stop, in combination with the indicating levers for regulating the feed of the line of type, and also in combination therewith the mechanism for restoring said levers into position when about to return for a new setting, and for setting the frame against its guide plate. 14th, The arrangement of mechanism for transmitting the movements produced upon the levers by the nicks in the type, and for effecting the proper combinations upon the indicators, consisting of the detaining levers, the bars, and the connecting levers, together with the operating cams upon the shaft, or any equivalent combination, whereby the same results will be produced. 15th, The mechanism for feeding up the column of type, and for elevating the successive lines thereof into the channel, or equivalent devices. 16th, The method of engaging and disengaging the feeding pawls, consisting of the hanging lever, in combination with the frame with the means for depressing the bolt, and with the ratchet having the engaging and disengaging wedges. 17th, In combination with the keys, the arrangement of mechanism whereby the separate different signals represented by each of a great number of keys may be produced by a less number of indicators. 18th, The radially revolving registering levers, in combination with the register wheel, and with the keys, or the equivalents thereof. 19th, The independent registering apparatus, or its equivalent apparatus, which will effect the recording of the letters or signs, as indicated by the keys, independently of the type carrying apparatus. 20th, The mechanism for transmitting the indicators from the register, consisting of the detaining levers, or equivalents, in combination with the setting indicators, and with the register. 21st, So combining the register and the setting indicators with the type-carrier, that the latter shall effect the movements of the register, to set the indicators in time to act upon the setting conveyers, and immediately thereafter effect the retreat of the said indicators previous to the passage of a distributing conveyer."

146. For an *Improved Method of Manufacturing Shingles;* James E. Young, Augusta, Maine.

Claim.—"Vibrating the shingle bolt about an axis lying in or near the plane of the cut, and equally distant from each end of the bolt. Also, the sliding rod and wedges."

147. For an *Improved arrangement of Means for Reefing and Furling Sails:* George W. La Baw, Jersey City, N. J., Assignor to self and Charles A. Durgin, City of New York.

Claim.—"The arrangement of vertical rollers in front or rear of the mast, and operated by mechanism from the deck of the vessel, and whereby I am enabled to operate separately or together the sails on each mast from the deck, irrespective of the mechanism employed for working the vertical rollers."

148. For an *Improved Saw Filer;* Jasper J. Near, Oneida, Assignor to Eli Near and Levi Vandusen, Madison Co., New York.

Claim.—"A clamp to gripe the saw and carrying hinged vibrating arms, provided with springs for holding and operating the file."

149. For an *arrangement of Passages and Means for Working Steam Valves by the direct action of Steam:* Barnabus Ruberts and Alexander Crumbie, Assignors to selves and John Benson, Brooklyn, New York.

"This invention consists in so arranging and working the valves, that we are enabled to make a simple and economical engine."

Claim.—"The arrangement of the steam channels, which are opened and closed by the travel of the main piston, connecting the steam chest and cylinder, in combination with the pistons of equal areas, or their equivalents."

150. For an *Improved Mode of Controlling Cog-gear Sash Balance;* John McMurtry, Lexington, Assignor to Daniel Wiehl, Fayette Co., Kentucky.

Claim.—"Arranging the cog-gears of the lower sash on the shaft which is capable of turning vertically and sliding horizontally, and which has arranged on its back end a locking plate, which slides with it, but which cannot turn with it, said plate having a bur or cog on its edge, which serves as a stop to hold both or either of the sashes in any desired position when geared together or separately."

151. For an *Improvement in Brick Machines;* George J. Washburn, Assignor to self and Anson L. Hobart, Worcester, Massachusetts.

Claim.—"The combination of the moulds of the frame and hopper, constructed, arranged, and operating together."

152. For an *Improved Boot and Shoe Sole Cutter;* Parker Wells, Middletown, Assignor to Samuel Mower, Boston, Massachusetts.

Claim.—"The combination of a cutter or cutters, with a yielding slide."

153. For an *Improvement in Locks;* H. W. Covert, Roxbury, New York.

Claim.—"The combination of the disks with the cones, cylinders, or disks."

SEPTEMBER 22.

154. For an *Improved Cutting Apparatus for Grain and Grass Harvesters;* John W. Baltzly and Wm. Hobson, Pana, Illinois.

Claim.—"The reciprocating teeth, in combination with the stationary cutting plates in the fingers."

155. For an *Improvement in Gas Burners;* Wm. W. Batchelder, City of N. York.

"My improvement in gas burners or jets, is a superior method of burning illuminating gas, whereby greater economy is obtained in the consumption, as well as a superior quality of light."

Claim.—"The improved method of burning gas, viz: combining two apertures of different areas, so arranged that a flat stratum of gas issuing in the first instance from the lesser aperture, shall impinge and press upon the second and larger aperture placed in the same plane with the issuing jet, and in such manner as to pass it without causing any deviation thereof."

156. For an *Improved Machine for Binding Grain;* Joseph F. Black, Lancaster, Ill.

Claim.—"The combination of the arms and hooks or clamps, constructed and arranged to operate conjointly."

157. For an *Improvement in Horse Powers;* George G. Burt, Abram and George F. Wright, Harvard, Massachusetts.

Claim.—"The method by which we are enabled to unerringly give such a shape to the ends of the tracks of said machine, that closely fitted platform chains may be operated upon them without producing any variation of tension or irregularity in the movements of said chains."

158. For an *Improvement in Life Boats;* Mortimer M. Camp, New Haven, Conn.

Claim.—"1st, Dividing the hold of a life boat into sections by the bulkhead, and

having an aperture in the bulkhead to be covered and closed by the swing hatch. 2d, Making the section of the hatch to operate as a cover or valve to close the aperture in the bulkhead. 3d, The combination of the movable combings with the hatch and the aperture in the bulkhead."

159. For an *Improvement in Bearings for Mill-stone Drivers;* Edwin Clark, Lancaster, Pennsylvania.

Claim.—"The rocking bearing consisting of a cylindrical portion inserted within a cavity in the bearing block, and a wing portion passing through a slot in said bearing block, in combination with the bearing recess in the driver."

160. For an *Improvement in Metallic Packing Rings for Steam Engines;* Patrick Clark, Rahway, New Jersey.

Claim.—"Constructing packing rings of a number or series of layers or lamina of sheet metal, for the purpose of securing that flexibility necessary to enable me to bend around a rod a metallic ring having a sufficient quantity of material in it to insure the requisite durability."

161. For an *Improvement in Burglars' Alarms;* Simeon Coon, Ithaca, New York.

Claim.—"The combining the spring and hammer in one piece, and acting on a stirrup."

162. For an *Improved Edge-plane for Trimming Boot and Shoe Soles;* Isaac A. Dunham, North Bridgewater, Massachusetts.

Claim.—"The new sole or welt trimmer constructed with a cutting blade and guard that together form a circle or very nearly, and with the cutter so arranged as to be set up to its guard as fast as it becomes worn, by simply turning the said cutter on its centre."

163. For an *Improvement in Reaping and Mowing Machines;* John G. Dunham, Raritan, New Jersey.

"This invention consists in so arranging and constructing the outer end of the sickle beam, that it can be sustained at different heights by the use of a single wheel, and thus both ends of the sickle beam be kept on a level with each other."

Claim.—"In combination with the rear part of the rectangular frame, the supporting castor wheels, with the inclined sliding frame and arms, adjustable brace, and inclined bar, furnished with a series of sockets."

164. For an *Improvement in Port-folio or Music Stands;* Augustus Eliaers, Boston, Massachusetts.

Claim.—"Arranging the braces or sliding frames which are hinged to and support the adjustable leaves of a port-folio stand, in such a way that they shall in sliding always keep in nearly a vertical position, for the better supporting the leaves and the weight upon them, by having the traversing and bolting rods move in curved grooves directly beneath them in the sides of the stand, instead of having the bolting rods of each brace or frame slide in grooves on the other or opposite side of the centre of said stand, in combination with the locking devices for the purpose of rigidly locking and supporting the leaves, and whereby the whole stand can be lifted by the leaves in removing it from place to place."

165. For an *Improvement in Harvesters;* Andrew B. J. Flowers, Greenfield, Ind.

Claim.—"Guiding the machine by means of the castor wheels, upright shaft, and the horizontal shaft, in combination with the peculiarly constructed castor plates, said parts being arranged to operate in relation to each other."

166. For an *Improvement in Steam Heating Apparatus;* Edmund Gibbs, Madison, Wisconsin.

Claim.—"The boiler with its trough, operating in combination with the coil of pipe and its prongs, or their equivalents."

167. For an *Improved Apparatus for Loading Logs on Wagons;* Philander Gilbert, Alexandria, Ohio.

Claim.—"The peculiar construction and arrangements of the portable frame, when combined with a windlass and its appurtenances, capable of being shifted to either side of a wagon."

168. For an *Improvement in Locks;* Joseph L. Hall, Cincinnati, Ohio.

Claim.—"1st, The construction and arrangement of tumblers in connexion with the block and back plate, the whole serving as a screen or curtain between the key-hole and the more interior parts. 2d, The construction and arrangement of bit, lever, and tumblers, whereby the bolt is held securely to its locked position, until the withdrawal of the key. 3d, The combination of the bit, dog, and arm, for the purpose of tightening the spring."

169. For an *Improvement in the Process of Making White Lead;* Henry Hannen, Dubuque, Iowa.

Claim.—"Subjecting the lead and compounds formed therefrom by the agents employed for this purpose to the action of steam and air, vapor of acetic acid, and carbonic acid gas, alternately and successively, until the process is complete."

170. For an *Improved Safety Clasp for Bracelets, &c.;* Isaac Hermann, City of New York.

Claim.—"The application of the two inclined plane surfaces and the plate attached to rod, to secure more safely clasps on bracelets, and for other purposes. Also, the combination of the steadying plate, which plate prevents the catches from turning aside; the whole is in combination, that is, plate, inclined planes, and rod."

171. For an *Improvement in Stirrups for Riding Saddles;* Dr. James Neil, Yorkville, New York.

Claim.—"The extension piece or lever, arranged and applied to the stirrup, so that when the rider falls, his foot if it remain in the stirrup shall operate the said extension piece or lever, so as to free one end of the bar, and thus release the stirrup from the stirrup strap."

172. For an *Improved Sleeve Fastener;* David C. Peacock, Brooklyn, New York.

Claim.—"The construction of a sleeve button secured by a bar affixed thereto at one end by a joint or hinge by passing through holes in the sleeve, and being secured or fastened at the end opposite to the affixed end."

173. For an *Improvement in Journals of Axles with Friction Rollers;* George A. Prentiss, Cambridge, Massachusetts.

Claim.—"The securing journals applied to the solid axle and friction rollers."

174. For an *Improved Hand Stamp;* T. J. W. Robertson, City of New York.

Claim.—"The construction of hand stamps."

175. For an *Improved Machine for Filing and Setting Saws;* Ansley C. Smith and Joseph K. Creighton, East Birmingham, Pennsylvania.

Claim.—"The combination of the filing, setting, and feeding device, when the whole is arranged to operate conjointly and automatically."

176. For an *Improvement in the Mode of Connecting and Disconnecting the Blocks of Iron or other Pavements;* Barzillai C. Smith, Burlington, New Jersey.

Claim.—"The mode of locking the plates or blocks of iron pavements, the same consisting of the locking bar and grooves, one of which is of sufficient depth to cover the entire width of the bar, while the other is of half that depth; and in combination therewith, I claim the grooves."

177. For an *Improvement in Railroad Car Seats;* J. H. Swan, City of New York.

Claim.—"The combination of the reversible back and seat, by means of the lever. Also, in combination of the levers, arms, and segment, with their attachment for reversing the back."

178. For an *Improvement in the Trussed Bridge;* Abram S. Swartz, Buffalo, New York.

Claim.—"The arrangement of the parts so that the tower, the tension bars, and the suspension rod, when taken together will present the distinctive feature of a triangle, with the foot of the arch resting upon the tower within the triangle."

179. For an *Improved Carriage Prop;* Chauncey Thomas, West Newbury, Mass.

Claim.—"My improved carriage prop as constructed with a screw shoulder cap, com-

bined with a joint bar standard, and arranged between the leather and the joint bars, and so as to screw upon the said standard."

180. For an *Improvement in Rotary Steam Engines;* D. C. Turner, Aztalan, Wis.

Claim.—"The velve in its recessed seat, and the protuberant rim, as arranged with the steam channels, floating abutments, and hinged pistons."

181. For an *Improvement in Rakes for Harvesters;* Isaac Van Doren, Somerville, New Jersey.

Claim.—"Operating the rake when arranged in relation to the platform, by means of the double geared sector, in combination with the rod and rock shaft, or their equivalent."

182. For an *Improvement in Carding Engines;* Wm. H. Walton, Brooklyn, N. Y., and George H. Phinney, City of New York.

"This invention consists in the use of a cylinder brush arranged with a lever in such a manner as to oscillate to and from the main cylinder for the purpose of cleaning the same."

Claim.—"The application and use of a rotary brush for stripping the main cylinder, in combination with the lever, or its equivalent, by which the main cylinder is stripped and cleaned when running at the speed given, by shifting the driving belt from the driving pulley to the loose pulley."

183. For an *Improved Nut Machine;* Samuel H. Whitaker, Cincinnati, Ohio.

"This invention consists in a provision for making metallic nuts of definite thickness and materially varying from that of the bar, and so as to save the scrap produced by punching."

Claim.—"The use of the preparatory punch and die, with the shearing and finishing die, punch, or mandrel, and counter die, whereby a nut of definite thickness is formed by first partially punching the blank while joined to the bar, and confined on every other side, then separating the blank and completing the punching and shaping."

184. For an *Improvement in Valve Gear for Oscillating Steam Engines;* Norman W. Wheeler, City of New York.

Claim.—"Actuating the valves of oscillating steam engines by the combined movements of the cylinder and piston rod."

185. For an *Improvement in Diving Apparatus;* George Williamson, Brooklyn, New York.

Claim.—"The employment, in combination with the nautilus of the channel ways, for the escape at the sides of the compressed air from the working chamber, the said channel ways being made in the thickness at the bottom of the nautilus, that is, between the floor of the working chamber and the outer bottom surface of the nautilus. Also, combining the nautilus with, and suspending it to, a float or buoy, so that the apparatus for operating the connecting rope, or equivalent, may be worked from the inside of the nautilus. Also, combining a spring balance or scale, with the combined nautilus and float."

186. For an *Improved Fly-trap;* Samuel R. Wilmot, Watertown, Connecticut.

Claim.—"A fly-trap consisting of a receptacle which is constructed and operated in such manner that when it is swept over a table or other object, the mouth is open to receive flies, and when the sweeping movement is finished, the mouth is closed to prevent their escape."

187. For an *Improved Fire Escape Ladder;* Henry Loewenberg, City of New York.

Claim.—"The manner of regulating or adjusting the trucks by means of the hinged guide pole or guide bars, arranged and operating in the manner and for the purpose of supporting the ladders when secured by the rope at any desired angle."

188. For an *Improved Cooler;* W. E. Messenger and Henry Rehahn, City of New York.

"Our invention consists of a hollow vessel for receiving the ice made in the form of

a saddle, so that it may be readily set or placed on the top of barrels or casks, containing the liquid to be refrigerated."

Claim.—"The refrigerating saddle."

189. For an *Improved Machine for Distributing Type;* W. H. Mitchel, Brooklyn, N.Y.

Claim.—"1st, The inclined check block, in combination with notches in the sides of the types, so placed that the notch of the first type comes in contact with the said inclined check block, when the type is projected its thickness beyond the end of the slide containing the line of types, so that only one type at a time is separated from the line of types. 2d, The use of studs or pins uniformly placed to take notches variously placed in the types, thereby sustaining the types in various positions, to be dropped or distributed when said types reach receptacles adapted to the peculiar position of said types. 3d, The method of distributing types by the revolving wheel, with its grooves and pins, when combined with the stationary inclines or off-sets. 4th, Distributing types from uniformly placed and moving pins, or their equivalents, by the use of a second notch in the type, combined with suitable off-sets or inclines to disengage the first notch of the type, and then allow the type to be suspended by the second notch for distribution, thereby providing for distributing greater varieties of type without requiring extreme accuracy in the position of the notches. 5th, The oscillating ring and connecting rods, in combination with the pushers."

190. For an *Improvement in Pencil Sharpeners;* Joseph W. Strange and Samuel Darling, Bangor, Maine.

Claim.—"The combination of two cutters constructed and arranged to reduce the wood and the lead separately."

191. For an *Improved Wrench;* Henry D. Blake, New Hartford, Assignor to W. H. Warner, New Britain, Connecticut.

Claim.—"The combination with a vibrating stock or handle, arranged for action, of the two or inner and outer sliding jaws of the wrench, jointed on opposite sides to said stock or handle, and both jaws operated or expanded and contracted in reverse directions to effect and release the gripe by the lateral throw or motion proper of said handle, in both directions of its swing. Also, while not claiming a projecting thumb-piece to a single sliding jaw, to lock or release the gripe of the same by means of a cam, or its equivalent, connected therewith. I do not claim providing the one jaw with a projecting thumb-piece, arranged to overlap the jointed attachment of said jaw to the stock, and forming a rigid extension as it were of said jaw to facilitate the action or movement of both jaws."

192. For an *Improvement in Harvesters;* Samuel Pennock, Assignor to self and Morton Pennock, Kennett's Square, Pennsylvania.

Claim.—"Adjusting and regulating the position of the crank shaft, by means of mechanism."

193. For an *Improvement in Lathes for Manufacture of Clothes Pins, etc.;* John Humphrey, Keene, Assignor to self and Amos E. Perry, Harrisville, N. H.

Claim.—"The method of feeding the pieces to be turned to the spindles, when their relative positions are changed, and in combination with the above, removing the finished pieces from the spindles."

SEPTEMBER 29.

194. For an *Improved Method of Holding and Setting the Log in Circular Sawing Machines;* James H. Bachelder, Rome, Michigan.

"This invention relates to an improvement in that class of sawing machines which are designed for sawing both fence pickets, and similar stuff, or articles direct from the log."

Claim.—"1st, Setting the log to the saws or giving it its lateral movement at the termination of each stroke or movement of the carriage, by means of the screws on which the nuts on the uprights work, the screw being turned at the proper time by means of the belt, which is made to act upon the wheel by means of the loop attached to lever, the lever being actuated by the forked lever coming in contact with the projections on the plates attached to beam, the length of movement of the log being determined or regulated by the rack, rod, pawl, or any equivalent device. 2d, Securing the log in the carriage or to the cross-piece supported therein by the uprights, by means of the rods attached to the cross-piece, by means of the plates and rods having eccentrics on

them. The eccentrics being in one end of the plates, and the rods passing through the opposite ends."

195. For an *Improvement in Compositions for Covering Meats;* John J. Bate, Brooklyn, New York, and Francis S. Low, Jersey City, New Jersey.

Claim.—"The use of shellac, varnish, and beeswax, in combination with the materials, and in about the proportions named, for the purpose of forming the composition."

196. For an *Improvement in Lard Rendering Kettles;* J. J. Bate, Brooklyn, N. Y.

Claim.—"The combination of the valve, acting both as a shifting and a vacuum valve, with the shell and kettle."

197. For an *Improvement in Steam Pressure Gauges;* H. Bates, New London, Conn.

Claim.—"The arrangement of the sector with teeth on its side face, and radial bearing projection near its axis, on an axis which is at right angles to the shaft of the pointer pinion, and to a controlling stud which terminates in an eccentric curve."

198. For an *Improved Apparatus for Opening Oysters;* W. Beach, Baltimore, Md.

Claim.—"The combination of lipped bar, treadle, and spring, with the cutting head piece."

199. For an *Improvement in Life Preservers;* Charles J. Bunker, City of N. York.

Claim.—"A life preserver, constructed of two or more sheets of water-proof fabric, with the series of air cells arranged so as to cover the upper and vital parts of the body."

200. For an *Improvement in the Cribs of Horses' Stables;* Wm. Croasdale, Harstville, Pennsylvania.

Claim.—"The revolving roller, in connexion with the striker."

201. For an *Improvement in Steam Boilers;* W. M. and J. B. Ellis, Washington, D. C.

Claim.—"Connecting the upper and lower parts of the shell of the body of the boiler, by means of a strong perforated plate, which performs the double office of staying the boiler and forming a passage for the circulation of the water and steam through the legs and body of the boiler."

202. For an *Improvement in Fastenings for Jewelry;* J. T. Folwell, Philadelphia, Pa.

Claim.—"The round post with a notch filed in it to receive the pin or tongue in, and a sheath fitting tight round the post, and shifted by a lever, so that when in one position, the tongue can be put into the notch, and when put into the opposite position it secures the tongue in its place, so that it cannot come out without shifting the lever."

203. For an *Improvement in Preparing Roofing Cements;* R. T. Havens, Casstown, O.

Claim.—"The process of combining and pressing coal tar and sand with paper or wood, for the production of an artificial slate."

204. For an *Improvement in Factitious Oils;* Joseph W. Harmon, Elizabethtown, N. J.

Claim.—"The employment of the residuum of candle manufactories, compounded with the ingredients in the manufacture of a compound oil."

205. For an *Improved Hydraulic Engine;* John D. Heaton, Dixon, Illinois.

Claim.—"The peculiarly constructed form and application, and the arrangement of the stationary valves, and as operated. Also, the construction and arrangement of the water chambers, pressure compartments, and cylinder, combined in one single piece."

206. For an *Improvement in Coating Hose Pipe;* C. H. Hinckley, Stonington, Conn.

Claim.—"The process of constructing pipe of textile and fibrous materials, with an internal coating of vulcanized india rubber, viz: by first applying the india rubber coating on the outside, and afterwards inverting the same by drawing it over and through a metallic cylinder."

207. For an *Improved Bit-Holder;* Benjamin B. Hill, Chicopee, Massachusetts.

Claim.—"The diagonal bit-holder, having a projection or rest which forms a guard to the level gears, and gives support to the bit."

208. For an *Improved Approach Opening Gate;* Charles A. Howard, Pontiac, Mich.

Claim.—"Applying the power of a weight or spring to the gate through the medium of the crank shaft connecting rods, in combination with the latch or catch, arranged with the levers and bars so as to operate conjointly."

209. For an *Improvement in Reed Stops for Musical Instruments;* Amos P. Hughes, Philadelphia, Pennsylvania.

Claim.—"The stopping of reeds by forming an air tight chamber or chambers outside of the reeds with the swell, or by other means, in combination with the open communication between the inside of the chamber or chambers, and the interior of the wind-chest or bellows, or any other arrangement substantially the same."

210. For an *Improvement in Sewing Machines;* Edward A. Jenks and John Underwood, Lowell, Massachusetts.

Claim.—"The arrangement of the spring feed piece with its pressure guide or sheath. Also, the rollers and looper as arranged and operating, in combination with the needle."

211. For an *Improvement in Cork Sole Stuff;* Wm. Johnson, Brooklyn, New York.

"This invention consists in rendering silk, cotton, leather, or other material, waterproof, with all the requisite qualities of solid sheet cork."

Claim.—"The making of cork cloth for inside soles and lining of boots, shoes, and other articles, for which solid sheet cork has hitherto been applied, using for that purpose materials to produce the same results."

212. For an *Improved Machine for Cutting Bungs;* Josiah Kirby, Cincinnati, Ohio.

Claim.—"The oscillating bit-holders, when operated by means of opposite bevels on the centre-rod, acting against the adjusting rods and the tail-screws. Also, the mode of grasping the block and freeing the finished bung."

213 For an *Improvement in Setting Diamonds, &c.;* Isaac Lindsley, Providence, R. I.

Claim.—"The raising of points or studs on the veins of the blank by the same punching operation which forms the blank, thereby producing a superior setting, which gives a greater brilliancy to the stones at a cost of labor not greater than that of the setting commonly used in cheap jewelry."

214. For an *Improvement in Gas Burners;* Wm. H. Lindsay, Brooklyn, New York.

"This invention consists in the use of certain deflectors with a fish-tail or other burner of suitable construction, for producing a more perfect combustion of the gas, with an increased intensity of light."

Claim.—"The application to a gas burner or burners of angular pieces or deflectors, or the equivalent thereof, for the purpose of increasing the light derived from one or more streams of gas issuing or escaping from a gas burner or burners of any suitable construction, by altering and directing the current or currents of gas, and the form of flame."

215. For an *Improvement in Hame-tug Fastening;* W. J. Lockwood, Sturgis, Mich.

Claim.—"The stud or button holder, and the button or lock, in combination with the socket, when operating together."

216. For an *Improvement in the Manufacture of the "Uppers" of Boots and Shoes without Seams;* Samuel Middleton, England; patented in England Nov. 3, 1856.

Claim.—"Stretching and forming the upper leather for boots and shoes from a single piece of leather without seams."

217. For an *Improvement in Burglars' Alarms;* E. M. and J. E. Mix, Ithaca, N. Y.

Claim.—"The construction of the device, to wit, the hammer or cock, spring, trigger, and rod, constructed, arranged, and applied to the barrel and stock."

218. For an *Improved Apparatus for Separating Oily Matter from Water;* James Naughten, Cincinnati, Ohio.

Claim.—"The arrangement of the chambers when the chambers are connected with the opening."

219. For an *Improvement in Spikes;* Orrin Newton, Pittsburgh, Pennsylvania.

Claim.—"Constructing the spike with concave sides and edges."

220. For an *Improvement in Corn Shellers;* J. J. Parker, Marietta, Ohio.

Claim.—"The necked shelling-wheel, when arranged and operating in connexion with the shelling-wheel and elastic side of spout and spring."

221. For an *Improved Apparatus for Roasting on Cooking Stoves, Ranges, &c.;* Samuel Pierce, Troy, New York.

Claim.—"The construction and arrangement of the apparatus for the purpose of combining with a range or stove for the purpose of roasting."

222. For an *Improvement in Machines for Manufacturing Pottery Ware;* Philip Pointon, Baraboo, Wisconsin.

Claim.—"Operating the movable bottom and plunger simultaneously, by means of the sliding rods and cross-head, in combination with lever and rack."

223. For an *Improvement in Awning Frames for Horses Attachable to Harness;* N. Pullman, New Oregon, Iowa.

Claim.—"1st, Arranging the frame for the support of an awning over draft horses, with a flexible joint, so that it can be folded back from the head and neck of the horse, and removed with the harness. 2d, Connecting the front bow with the bridle, by means of flexible bands."

224. For an *Improvement in Fastening for Metallic Bands of Cotton Bales, &c.;* Charles J. Provost, Sardis, Alabama.

Claim.—"So forming the slide as that its ends may be struck down behind the bow or bend of the locks, and thus not only prevent the lock from separating, but also hold in the slide to the lock."

225. For an *Improved Apparatus to Protect Buildings from Fire;* Thomas Odion, Portsmouth, New Hampshire.

Claim.—"The method of protecting property against fire by means of a portable screen."

226. For an *Improved Method of Attaching Adjustable Handles to Joiners' Planes;* Thomas D. Worrall, Lowell, Massachusetts.

"This invention consists in certain devices for attaching and adjusting the handles on moulding planes."

Claim.—"1st, The combination and arrangement of cap-plate, screw, nut, and slot, in the plane, for the purpose of providing and securing a movable handle to planes. 2d, The arrangement of cap-plate, slotted strap, and screw, for the purpose of adjusting the handle vertically when desired by the operator."

227. For an *Improvement in the Construction of Wire Fences;* J. B. Reyman, Bloomington, Illinois.

Claim.—"Bending or kinking the wires."

228. For an *Improved Method of Stemming and Polishing Pea Nuts;* Samuel Shepherd, Nashua, New Hampshire.

Claim—"Stemming and polishing pea nuts by means of machinery."

229. For an *Improvement in Hemp Brakes;* Conrad Simon, Louisville, Kentucky.

Claim.—"The combination of the breaking rollers with the mouth-piece."

230. For an *Improvement in Window for Locomotives, &c.;* H. Skinner, Fulton, N. Y.

Claim.—"The application of heat to glass to prevent vapor or frost from collecting thereon."

231. For an *Improved Drilling and Milling Machine;* Wm. D. Sloan, City of N. Y.

Claim.—"The mode of operation for securing and holding the blocks to the periphery of the wheel, by which they are shifted from place to place, which mode of operation results from the combination of the radially sliding stirrups, or their equivalents, with the wheel, and the mechanism operating the said stirrups to liberate and gripe the blocks, or any equivalent therefor. Also, connecting the stirrups, or any equivalent therefor, with the radially sliding rods, by a yielding joint, in combination with the oblique edges of the recesses in which they slide, or any equivalent therefor, so that the said stirrups when forced out shall be brought in a radial position, and be free to yield laterally to any irregularity of form of the blocks to be griped when drawn in. Also, in combination with the carrying wheel, or equivalents therefor, for holding and shifting the blocks, the two sets of hollow mandrels with appropriate cutters, and having a reciprocating motion in opposite directions for acting on the opposite ends of the blocks."

232. For an *Improved Mode of Attaching Elastic Soles to Horse Shoes;* Wm. Somerville, Buffalo, New York.

Claim.—"The sole provided with prongs or metallic projections, or their equivalents in combination with recesses or rebates, or their equivalents, in or above the shoe."

233. For an *Improved Hydro-carbon Vapor Lamp;* Isaac Suggitt, Providence, R. I.

Claim.—"A tube, in combination with arms or projections, and corrugated hoop, to be used in any container or lamp."

234. For an *Improved Method of Opening and Closing Vertico-lateral Folding Gates;* Francis Thrasher and Henry B. Horton, Akron, Ohio.

Claim.—"1st, Balancing the gate upon a single fulcrum pin, whilst the gate is held to the post and guided by another pin working in a slot, thus giving a steady motion to the gate in folding and unfolding. 2d, The eccentric quadrant plate, by means of which the action of weight, and also the action of the hand (when pulling upon either of the cords), are varied so as to easily set the gate in motion, and yet prevent the gate from opening or closing with violence. 3d, The combination of the crooked lever with the springs and cords, whereby a slight pull upon either of the cords will unlock the gate and let it fly open, whilst a stronger pull upon the same cord will close the gate."

235. For an *Improvement in Pumps;* J. D. West, City of New York.

Claim.—"The combination of the air chamber with two inner cylinders, and duplicate foot valves."

236. For an *Improvement in Hollow Metallic Lasts;* S. H. Whorf, Malden, Mass.

Claim.—"Making a last with the yielding or spring instep."

237. For an *Improvement in Variable Eccentrics for Operating the Valves of Steam Engines;* S. L. Wiegand, Philadelphia, Pennsylvania.

Claim.—"The arrangement of the double oblique slide upon the shaft, said slide passing through the eccentric."

238. For an *Improvement in Machines for Measuring Cloth;* Wm. W. Wythes, St. Clair, Pennsylvania.

Claim.—"1st, The arrangement of the measuring roller with the pressure roller, when the latter is hung loosely on a hinged spindle, and acted upon by a spring, and when it is exposed at the end for the admission of the fabric. 2d, The combination of the shape-wheel, lever, shaft, wheels, and numbered plate, index, and pointer."

239. For an *Improved Marine Propelling Apparatus;* Ethan Campbell, Boston, Assignor to Wm. C. Page, Cambridge, and Edward F. Hodges, Boston, Mass.

Claim.—"My improved propelling apparatus, constructed and operating so that its wing cylinder and wing plate may not only simultaneously rise and fall in their case, but at the same time have lateral motions in contrary directions, and the wing operate against a space so formed in, and applied to, the case, as not only to be in contact, or nearly so, with the opposite sides of the wing, but allow the vibratory as well as the up and down movements of the wing."

240. For an *Improved Tank for Locomotives;* John Kimball, Concord, New Hampshire, Assignor to Robert Hale, Roxbury, Massachusetts.

Claim.—"Dividing the water tank into two compartments, thus introducing a trap between the two, for the purpose of intercepting the passage of the oil to the boiler."

Re-Issues.

1. For an *Improvement in Looms;* Daniel W. Snell and Stephen S. Bartlett, Woonsocket, Rhode Island; patented January 13, 1857; re-issued September 1, 1857.

Claim.—"1st, Employing the positive take-up mechanism or cloth roll, or any mechanism acted on, or affected by, the strain of the cloth, when a positive take-up is used as the point through which the variable strain and wind of warps is made to act more sensitively, than from or by the variable vibratory reacting motion of the whip rolls, or sudden jerking of the beam or movable reed. 2d, Effecting and producing a regular delivery and uniform strain of the warps by the equalizing strain lever, or equivalent, said lever being acted upon by the variable strain of the warps or cloth through the positive take-up mechanism or cloth roll. 3d, The equalizing strain lever or analogous device, when operating in connexion with the positive take-up mechanism or cloth roll, or when effected by the strain of the cloth, in combination with any mechanism for producing a rotary motion to the beam, and with any device or means for regulating the delivery and strain of the warps as the beam decreases in diameter, and as the desired

strain requires. 4th, Employing the rod with the pin, or equivalent, to act upon the strain lever, as a means of moving the weight when the balance spring, or equivalent device, is not sufficient to move it. 5th, In combination with the pulley and pinion, the movable weight, the fixed or yielding sectional friction piece, and friction lever. 6th, In combination with the weight and friction lever, the rack, or its equivalent, to so act upon weight, through catches, or analogous devices, as to gradually move this weight towards the fulcrum of lever, as the bearer decreases in diameter, and as the desired strain of warp requires. 7th, In combination with the weight and friction lever, or equivalent devices, the jointed or stationary sectional friction piece, and set screw."

2. For an *Improvement in Carding Engines;* Wm. H. Walton, City of New York; patented December 9, 1856; re-issued January 13, 1857.

Claim.—"Suspending the top flats or workers upon pivots in the centre of their ends, by which they can be raised out of the way of the adjoining flats, and turned by a rack working into pinions, or the equivalent thereof. Also, stripping the flats or workers by a rotating brush, so arranged that a card may strip the brush and return the strippings to the main cylinder. Also, the combination and employment of two or more 'lickers-in,' acting as 'lickers-in' and 'workers,' by running in contact with each other, or their equivalent, for the purpose of working the fibre before it enters on to the main cylinder."

3. For an *Improvement in Compositions for Roofing;* James West, Syracuse, N. Y.; re-issued September 8, 1857.

Claim.—"The use of lime, in combination with the rubber or gutta-percha and shellac solutions, in the composition."

4. For an *Improvement in Elastic Gore Cloth;* Charles Winslow, Lynn, Mass.; patented August 4, 1857; re-issued September 15, 1857.

Claim.—"An elastic band or gore cloth, when made not only of a fabric composed of a cement of india rubber or gutta-percha, and two pieces of cloth, in which the warp and weft of each piece are made to cross one another diagonally or at acute angles, but with the edges of the cloth cut and overlapped, and cemented down in a line or lines out of parallelism with either the warp or weft threads, the line of maximum elasticity in the binding, making that angle with the warps as well as the weft which is the complement of half the angle which they make with each other."

5. For an *Improved Abdominal Supporter;* Julia M. Milligan, New Albany, Indiana; patented February 10, 1857; re-issued September 15, 1857.

Claim.—"The bandage provided with a series of cords and laces, or their equivalents."

6. For an *Improvement in Looms;* Wm. V. Gee, New Haven, Connecticut, Assignor to The Atwater and Bristol Manufacturing Co., Assignors to The Nashawannock Manufacturing Co., East Hampton, Mass.; patented February 27, 1855; re-issued September 15, 1857.

Claim.—"1st, Mounting a loom with two distinct sets of harness, each governing all the warp threads for the weaving of a web on one side of an intended button hole or slit, and capable of being thrown out of action each by itself, while the other set is in action, during the process of weaving button holes. 2d, Connecting each set of harness capable of being thrown in and out of action, and governing all the warp threads on either side, with a bar or slide governed by a cam or catch, or the equivalents thereof, to throw one or the other of the said sets of harness out of action when necessary. 3d, The combination of the mechanism for causing one set of harness to cease its action, or any equivalent therefor, with another mechanism for determining the period during which one set of harness shall remain out of action, or lay dormant, or the time or moment at which such harness shall cease to act, or any equivalent therefor. 4th, The combination of a slow moving cam or cams, or its or their equivalents, for determining the time and period, or time or period, during which a set of harness shall be out of action, with harness mounted in sets, each set governing all the warp threads on one side of a button hole, so that different sets of harness may be in action, or laying dormant, at proper times and for proper periods. 5th, A contrivance for throwing the take-up motion out of gear, or any equivalent therefor, for stopping the take-up, in combination with two sets of harness, each governing warp threads. And, lastly, the combination of a slow moving cam, or any equivalent thereof, with a mechanism for stopping or starting a take-up motion, or any equivalent therefor, whereby the time and period, or time or period, of the stoppage or cessation from action of a take-up motion, may be determined automatically."

7. For an *Improvement in Apparatus for Stenciling Window Shades;* Daniel Lloyd, Assignor to G. L. Kelty and D. M. Ferguson, City of New York; patented Jan. 29, 1856; re-issued September 15, 1857.

Claim.—"1st, Producing patterns on window shades in which long or continuous lines form a prominent feature, by means of a pair or pairs of stencils, of the full size of the design. 2d, The mode of registering the stencils by the use of the plates and pins, for the purpose of adjusting and readily adapting the stencils to shades."

8. For an *Improvement in Coating Water Pipes;* Jonathan Ball, Elmira, New York; patented December 15, 1843: re-issued September 15, 1857.

Claim.—"Lining metallic pipes with hydraulic cement, by means of a cone, or its equivalent, guided through the pipe so as to lay on the cement of equal thickness, and with great certainty and economy."

9. For an *Improvement in Cast Iron Car Wheels;* Anson Atwood, Troy, New York; patented May 15, 1847; re-issued September 22, 1857.

Claim.—"Connecting the rim of a wheel cast in one piece, with a solid hub, by means of a single waved plate, in combination with the dished flanches of the hub, forming a ring concentric with the rim of the wheel, whereby the several parts can yield to the unequal contraction in all directions, without serious strain of the metal."

10. For an *Improvement in Cast Iron Car Wheels;* Anson Atwood, Troy, New York; patented May 15, 1847; re-issued September 22, 1857.

Claim.—"A cast iron disk corrugated, when used in connexion with the chilled rim of a cast iron wheel."

11. For an *Improvement in Seed Planters;* Solomon T. Holly, Rockford, Illinois; re-issued September 22, 1857.

Claim.—"In combination with a machine that drops its seed automatically, a hand lever and clutching apparatus, that enables the operator to quicken or retard the dropping so as to bring it to the exact spot, and without disarranging or injuriously affecting the automatic movement. Also, in combination with the wheel having its centre of motion, and furnished with openings, the lever with its plate, and hung or pivoted at a point eccentric to the point, so that the plate can cover or be drawn within the range of the openings at stated intervals. Also, the employment or the use of the indicator, connected with the valve."

12. For an *Improved Process for Removing Photographs from Glass to Paper;* Edward Howell, Ashtabula, Ohio; patented May 19, 1857; re-issued Sept. 22, 1857.

Claim.—"The use of beeswax, or its equivalent, laid upon the surface of the glass plate previous to applying the collodion film, chemicals, and colors, for the purpose of facilitating the removal of the picture, together with the manner of causing the backing paper to adhere to the finished picture, thus giving it strength to overcome the adhesion of the wax, or its equivalent, to the plate of glass."

13. For an *Improvement in Ladies' Skirts;* Edward F. Woodward, City of New York, patented June 16, 1857; re-issued September 29, 1857.

Claim.—"Constructing hoops intended for ladies dresses, consisting of a spiral formed of any proper material, metallic or vegetable, either with or without a core to support the same, which can be bent into the form of a hoop, and inserted into ladies' skirts."

Designs.

1. For *Stoves;* N. S. Vedder, Troy, New York, Assignor to North, Chase & North, Philadelphia, Pennsylvania; dated September 1, 1857.
2. For *Stoves;* Thomas Barry, City of New York; September 1, 1857.
3. For *Type;* George Bruce, City of New York; dated September 8, 1857.
4. For *Sad Iron Stove;* S. W. Gibbs, Assignor to Winne & Abeil, Albany, New York; dated September 8, 1857.
5. For *Stoves;* Garretson Smith, Henry Brown, and Samuel H. Sailor, Assignors to I. G. Abbott & A. Lawrence, Philadelphia, Pennsylvania; dated September 15, 1857.
6. For *Gas Burner Shades;* George B. Foster, Boston, Massachusetts; dated September 22, 1857.

7. For *Stands to Hold Shovels and Tongs;* Julius Meyer, Assignor to M. Greenwood & Co., Cincinnati, Ohio; dated September 29, 1857.
8. For *Stands to Hold Shovels and Tongs;* Julius Meyer, Assignor to M. Greenwood & Co., Cincinnati, Ohio; dated September 29, 1857.

The claims on the foregoing are for the several shapes, forms, and ornaments.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Sounds Produced by the Combustion of Gases in Tubes.**

By John Tyndall, Esq., F.R.S.

In the first volume of "*Nicholson's Journal*," published in 1802, the sounds produced by the combustion of hydrogen in tubes are referred to as having been "made in Italy:" Dr. Higgins, in the same place, shows that he had discovered them in the year 1777, while observing the water formed in a glass vessel by the slow combustion of a slender stream of hydrogen. Chladni, in his "*Akustik*," published in 1802, page 74, speaks of their being mentioned, and incorrectly explained, by De Luc in his "*New Ideas on Meteorology*:" I do not know the date of the volume. Chladni himself showed that the tones produced were the same as those of an open pipe of the same length as the tube which encompassed the flame. He also succeeded in obtaining a tone and its octave from the same tube, and in one case obtained the fifth of the octave. In a paper published in the *Journal de Physique* in 1802, G. De la Rive endeavored to account for the sounds by referring them to the alternate contraction and expansion of aqueous vapor; basing his opinion upon a series of experiments of great beauty and ingenuity made with the bulbs of thermometers. In 1818, Mr. Faraday took up the subject, and showed that the tones were produced when the glass tube was enveloped by an atmosphere higher in temperature than 212° Fahr. That they were not due to aqueous vapor, was further shown by the fact that they could be produced by the combustion of carbonic oxide. He referred the sounds to successive explosions produced by the periodic combination of the atmospheric oxygen with the issuing jet of hydrogen gas. This is undoubtedly the true source of the sounds.

I am not aware that the dependence of the pitch of the note on the size of the flame has as yet been noticed. To this point I will, in the first place, briefly direct attention.

A tube 25 inches long was placed over an ignited jet of hydrogen: the sound produced was the fundamental note of the tube.

A tube 12½ inches long was brought over the same flame, but no sound was obtained.

The flame was lowered, so as to make it as small as possible, and the tube last mentioned was again brought over it; it gave a clear melodious note, which was the octave of that obtained with the 25-inch tube.

The 25-inch tube was now brought over the same flame; it no longer

* From the Journal of Gas Lighting, &c., No. 126.

gave its fundamental note, but exactly the same note as that obtained from the tube of half its length.

Thus we see, that although the speed with which the explosions succeed each other depends upon the length of the tube, the flame has also a voice in the matter: that to produce a musical sound, its size must be such as to enable it to explode in unison either with the fundamental pulses of the tube, or with the pulses of its harmonic divisions.

With a tube 6 feet 9 inches long, by varying the size of the flame, and adjusting the depth to which it reached within the tube, I have obtained a series of notes in the ratio of the numbers 1, 2, 3, 4, 5.

These experiments explain the capricious nature of the sounds sometimes obtained by lecturers upon this subject. It is, however, always possible to render the sounds clear and sweet, by suitably adjusting the size of the flame to the length of the tube.*

Since the experiments of Mr. Faraday, nothing, that I am aware of, has been added to this subject, until quite recently. In a recent number of Poggendorff's "*Annalen*," an interesting experiment is described by M. Schaffgotsch, and made the subject of some remarks by Prof. Poggendorff himself. A musical note was obtained with a jet of ordinary coal gas, and it was found that when the voice was pitched to the same note, the flame assumed a lively motion, which could be augmented until the flame was actually extinguished. M. Schaffgotsch does not describe the conditions necessary to the success of his experiment; and it was while endeavoring to find out these conditions that I alighted upon the facts which form the principal subject of this brief notice. I may remark that M. Schaffgotsch's result may be produced, with certainty, if the gas be caused to issue under sufficient pressure through a very small orifice.

In the first experiments I made use of a tapering brass jet, 10½ inches long, and having a superior orifice about $\frac{1}{20}$th of an inch in diameter. The shaking of the singing flame, within the glass tube, when the voice was properly pitched, was so manifest as to be seen by several hundred people at once.

I placed a syrene within a few feet of the singing flame, and gradually heightened the note produced by the instrument. As the sounds of the flame and syrene approached perfect unison, the flame shook, jumping up and down within the tube. The interval between the jumps became greater, until the unison was perfect, when the motion ceased for an instant; the syrene still increasing in pitch, the motion of the flame again appeared, the jumpings became quicker and quicker, until finally it escaped cognizance by the eye.

This experiment showed that the jumping of the flame, observed by M. Schaffgotsch, is the optical expression of the *beats* which occur at each side of the perfect unison; the beats could be heard in exact accordance with the shortening and lengthening of the flame. Beyond

* With a tube 14½ inches in length and an exceedingly minute jet of gas, I obtained, without altering the quantity of gas, a note and its octave: the flame possessed the power of changing its own dimensions to suit both notes.

the region of these beats, in both directions, the sound of the syrene produced no visible motion of the flame. What is true of the syrene is true of the voice.

While repeating and varying these experiments, I once had a silent flame within a tube, and on pitching my voice to the note of the tube, the flame, to my great surprise, instantly started into song. Placing the finger on the end of the tube, and silencing the melody, on repeating the experiment, the same result was obtained.

I placed the syrene near the flame, as before. The latter was burning tranquilly within its tube. Ascending gradually from the lowest notes of the instrument, at the moment when the sound of the syrene reached the pitch of the tube which surrounded the gas flame, the latter suddenly stretched itself and commenced its song, which continued indefinitely after the syrene had ceased to sound.

With the jet which I have described, and a glass tube, 12 inches long, and from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch internal diameter, this result can be obtained with ease and certainty. If the voice be thrown a little higher or lower than the note due to the tube, no visible effect is produced upon the flame: the pitch of the voice must lie within the region of the audible beats.

By varying the length of the tube we vary the note produced, and the voice must be modified accordingly.

That the shaking of the flame, to which I have already referred, proceeds in exact accordance with the beats, is beautifully shown by a tuning-fork which gives the same note as the flame. Loading the fork so as to throw it slightly out of unison with the flame, when the former is sounded and brought near the flame, the jumpings are seen at exactly the same intervals as those in which the beats are heard. When the tuning-fork is brought over a resonant jar or bottle, the beats may be heard and the jumpings seen by a thousand people at once. By changing the load upon the tuning-fork, or by slightly altering the size of the flame, the quickness with which the beats succeed each other may be changed, but in all cases the jumpings address the eye at the same moment that the beats address the ear.

With the tuning-fork I have obtained the same results as with the voice and syrene. Holding a fork over a tube which responds to it, and which contains within it a silent flame of gas, the latter immediately starts into song. I have obtained this result with a series of tubes varying from $10\frac{1}{2}$ to 29 inches in length. The following experiment could be made. A series of tubes, capable of producing the notes of the gamut, might be placed over suitable jets of gas; all being silent, let the gamut be run over by a musician with an instrument sufficiently powerful, placed at a distance of twenty or thirty yards. At the sound of each particular note, the gas-jet contained in the corresponding tube would instantly start into song.

I must remark, however, that with the jet which I have used, the experiment is most easily made with a tube about 11 or 12 inches long; with longer tubes it is more difficult to prevent the flame from singing spontaneously, that is, without external excitation.

The principal point to be attended to is this. With a tube, say of 12 inches in length, the flame requires to occupy a certain position in the tube in order that it shall sing with a maximum intensity. Let the tube be raised, so that the flame may penetrate it to a less extent; the energy of the sound will be thereby diminished, and a point (A), will at length be attained where it will cease altogether. Above this point, for a certain distance, the flame may be caused to burn tranquilly and silently for any length of time, but when excited by the voice it will sing.

When the flame is too near the point (A), on being excited by the voice or by a tuning-fork, it will respond for a short time and then cease. A little above the point where this cessation occurs, the flame burns tranquilly, if unexcited, but if once caused to sing it will continue to sing. With such a flame, which is not too sensitive to external impressions, I have been able *to reverse the effect hitherto described*, and to stop the song at pleasure by the sound of my voice, or by a tuning-fork, without quenching the flame itself. Such a flame I find may be made to obey the word of command, and to sing or cease to sing as the experimenter pleases.

The mere clapping of the hands, producing an explosion, shouting at an incorrect pitch, shaking of the tube surrounding the flame, are, when the arrangements are properly made, ineffectual. Each of these modes of disturbance doubtless affects the flame, but the impulses do not accumulate, as in the case where the note of the tube itself is struck. It appears as if the flame were *deaf* to a single impulse, as the tympanum would probably be, and, like the latter, needs the accumulation of impulses to give it sufficient motion. A difference of half a tone between two tuning-forks is sufficient to cause one of these to set the flame singing, while the other is powerless to produce this effect.

I have said that the voice must be pitched to the note of the tube which surrounds the flame; it would be more correct to say the note produced by the flame when singing. In all cases, this note is sensibly higher than that due to the open tube which surrounds the flame: this ought to be the case, because of the high temperature of the vibrating column. An open tube, for example, which, when a tuning-fork is held over its end, gives a maximum reinforcement, produces, when surrounding a single flame, a note higher than that of the fork. To obtain the latter note, the tube must be sensibly longer.

What is the constitution of the flame of gas while it produces musical sounds? This is the next question to which I will briefly call attention. Looked at with the naked eye, the sounding flame appears constant; but is the constancy real? Supposing each pulse to be accompanied by a physical change of the flame, such a change would not be perceptible to the naked eye, on account of the velocity with which the pulses succeed each other. The light of the flame would appear continuous on the same principle that the troubled portion of a descending liquid jet appears continuous, although by proper means this portion of a jet can be shown to be composed of isolated drops. If we cause the image of the flame to pass speedily over different portions of the retina, the

changes accompanying the periodic impulses will manifest themselves in the character of the image thus traced.

I took a glass tube 3 feet 2 inches long, and about an inch and a half in internal diameter, and, placing it over a very small flame of olefiant gas (common gas will also answer), obtained the fundamental note of the tube. On moving the head to and fro, the image of the sounding flame was separated into a series of distinct images: the distance between the images depended upon the velocity with which the head was moved. This experiment is suited to a darkened lecture-room. It was still easier to obtain the separation of the images in this way, when a tube 6 feet 9 inches in length and a larger flame were made use of.

As suggested to me by a lady to whom I had the pleasure of showing these experiments, the same result is obtained when an opera-glass is moved to and fro before the eye.

But the most convenient mode of observing the flame is with a mirror; and it can be seen either directly in the mirror, or by projection upon a screen.

A lens of 33 centimeters focus was placed in front of a flame of common gas, upwards of an inch long, and a paper screen was hung at about 6 or 8 feet distance behind the flame. In front of the lens a small looking-glass was held, which received the light that had passed through the lens, and reflected it back upon the screen placed behind the latter. By adjusting the position of the lens, a well-defined inverted image of the flame was obtained upon the screen. On moving the mirror the image was displaced; and, owing to the retention of the impression by the retina, when the movement was sufficiently speedy, the image described a continuous luminous track. Holding the mirror still, the 6 foot 9-inch tube was placed over the flame: the latter changed its shape the moment it commenced to sound, remaining, however, well defined upon the screen. On now moving the mirror, a totally different effect was produced: instead of a continuous track of light, a series of distinct images of the sounding flame was observed. The distance of these images apart varied with the motion of the mirror; and, of course, could be made, by suitably turning the reflector, to form a ring of images. The experiment is beautiful, and in a dark room may be made visible to a large audience.

The experiment was also varied in the following manner:—A triangular prism of wood had its sides coated with rectangular pieces of looking-glass; it was suspended by a thread, with its axis vertical; torsion was imparted to the thread, and the prism acted upon by this torsion caused to rotate. It was so placed that its three faces received in succession the beam of light sent from the flame through the lens in front of it, and through the images upon the screen. On commencing its motion, the images were but slightly separated, but became more and more so as the motion approached its maximum. This once past, the images drew closer together again, until they ended in a kind of luminous ripple. Allowing the acquired torsion to act, the same series of effects could be produced, the motion being in an opposite direction.

In these experiments, that half of the tube which was turned towards the screen was coated with lampblack, so as to cut off the direct light of the jet from the screen.*

But what is the state of the flame in the interval between two images? The flame of common gas or of olefiant gas, owes its luminousness to the solid particles of carbon discharged into it. If we blow against a luminous gas flame, a sound is heard, a small explosion in fact, and by such a puff the luminousness may be caused to disappear. During a windy night the exposed gas-jets in the shops are often deprived of their light and burn blue. In like manner the common blowpipe-jet deprives burning coal gas of its brilliant light. I hence concluded, that the explosions, the repetition of which produces the musical sound in the case before us, rendered, at the moment they occurred, the combustion so perfect as to extinguish the solid carbon particles; but I imagined that the images on the screen would, on closer examination, be found united by spaces of blue, which, owing to their dimness, were not seen by the method of projection. This, in many instances, was found to be the case.

I was not, however, prepared for the following result:—A flame of olefiant gas, rendered almost as small as it could be, was procured. The 3-foot 2-inch tube was placed over it; the flame on singing became elongated and lost some of its light, still it was bright at its top; looked at in the moving mirror, a beaded line of great beauty was observed: in front of each bead was a little luminous star; after it, and continuous with it, a spot of rich blue light, which terminated and left, as far as I could judge, a perfectly dark space between it and the next following luminous star. I shall examine this further when time permits me; but, as far as I can at present judge, the flame was actually extinguished and relighted in accordance with the sonorous pulsations.

When a silent flame, capable, however, of being excited by the voice in the manner already described, is placed within a tube, and the continuous line of light produced by it in the moving mirror is observed, I know no experiment more pretty than the resolution of this line into a string of richly luminous pearls at the instant when the voice is pitched to the proper note. This may be done at a considerable distance from the jet, and with the back turned towards it.

The change produced in the line of beads when a tuning-fork capable of giving beats with the flame is brought over the tube, or over a resonant jar near it, is also extremely interesting to observe. I will not at present enter into a more minute description of these results. Sufficient, I trust, has been said to induce experimenters to produce the effects for themselves; the sight of them will give more pleasure than any description of mine could possibly do.

* Since these experiments were made, Mr. Wheatstone has drawn my attention to the following passage, which proves that he was the first to make use of the rotating mirror in examining a singing flame:—"A flame of hydrogen gas burning in the open air presents a continuous circle in the mirror; but, while producing a sound within a glass tube, regular intermissions of intensity are observed, which present a chain-like appearance, and indicate alternate contractions and dilatations of the flame corresponding with the sonorous vibrations of the column of air."—*Phil. Trans.*, 1834, p. 586.

For the Journal of the Franklin Institute.

Particulars of the Steamer Independence.

Hull built by Samuel Sneden. Machinery, by the Morgan Iron Works, New York. Superintending Engineer, Erastus W. Smith.

HULL.—

Length on deck from fore part of stem to after part of stern post,	140 feet.	
Breadth of beam, (molded,)	26 "	
" " over planking,	26 "	6 inches
" " over guards,	40 "	
Depth of hold to spar deck,	10 "	3 "

Floor timbers at throats, molded, 14 inches;—sided, 10 and 12 inches;—distance between centres, 24 inches. Frames braced with diagonal iron bars 3½ by 9-16 inches, one to each frame, cross-laid and riveted at their crossings.

Draft of water in running trim,	6 "	9 "
Contents of bunkers in tons of coal,	30.	
Tonnage, custom-house,	400.	

ENGINES.—Two—Vertical beam.

Diameter of cylinder,		32 inches.
Length of stroke,	8 feet.	
Cut-off variable from ¼ to full stroke.		
Maximum pressure of steam above the atmosphere, in pounds,	30.	
Maximum revolutions per minute,	25.	

PADDLE WHEELS.—

Diameter,	24 feet.	
Length of paddles,	7 "	6 "
Depth "	1 "	8 "
Dip "	2 "	10 "
Number " in each wheel,	20.	
Material of wheels,	oak.	
Outside rims of iron, 3½ by 9-16 inches.		

BOILERS.—Two—Single return flued.

Length of boilers,	18 feet.	
Breadth " front,	7 "	6 "
" " back end,	7 "	6 "
Number of furnaces in each boiler,	2.	
Breadth "	3 "	2 "
Length of grate bars,	6 "	6 "
Height of steam chimneys,	9 "	
Internal diameter of "	3 "	"
External " "	5 "	2 "
Diameter of smoke pipe,	4 "	4 "
Height "	28 "	
Description of coal,	Bituminous.	
Draft,	Natural.	

Remarks.—The *Independence* was built by Captain Ezra Nye, of New York, for towing in the harbor of Valparaiso, S. A. She is single decked, with round stern; has high close bulwarks all around, which are solid forward and aft, a forcastle deck and half wheel guards. Is schooner rigged, and has no incumbrance on deck, except the pilot and engine house and wheel-houses.

The planking of the bottom, bilges, and sides, is of white oak, 3 ins. thick; square fastened with copper, and locust treenails. Ceiling is of 4 inch yellow pine. Deck beams are of yellow pine, 10 by 12 inches, 6 feet between centres, with lodger, bosom and hanging knees of hackmatack on each beam. Deck planks are of white pine, 3 inches thick. All subordinate parts are in proportion.

Engines are connected by a centre-shaft fitted with a connecting crank, which admits of their being worked separately or together. The boilers are fitted with connexion steam valves, admitting the connexion of either boiler, with either or both the engines.

Connected with the boilers is a large size independent "Worthington" steam fire and bilge pump, of a capacity of 800 gallons per minute, supplied with four branches for hose connexions and hose for extinguishing fire, and is to be used in Valaparaiso, as a floating steam fire engine. The vessel is also supplied with large iron tanks for fresh water, which by the aid of the steam pump will be supplied to vessels. E. W. S.

Coal and Iron in the Kingdom of the Two Sicilies.

The Neapolitan official journal speaks of the quantity of iron and coal with which the Kingdom of the Two Sicilies abounds, and anticipates the time when the country will be independent of the foreigner. With respect to coal, it says that several vast carboniferous barriers have been discovered, and that the one near Gerace is beginning to be productive. With regard to iron, the establishment of Mongiana and of Ferdinandea is spoken of with approbation, where, in six months of this year, 30,000 cantari of ghise (iron) are said to have been discovered. After three years of investigation in the Apennines, the mines of San Donato are said to have yielded 40,000 cantari of mineral, and those of Campoli the same. The mines of San Donato have four galleries. The mineral which is discovered there is of good quality, belonging to the "Limonite Ferro ossidato idrato." In the mines of Campoli, the mineral is of the same description, being an "idrossido di ferro." The report of General D'Agostino, the Inspector General, not a little expanded by the official journal, calls upon all Neapolitans to thank God for having bestowed on them a monarch to whom he has given such an energetic genius and so enlightened an intellect!

Original Omnibus.†

Who would have thought that the omnibus was an ancient institution; in fact, nearly two centuries old? Such, however, is the case, it appears. In 1662,—as we learn from the notes of a young and enterprising French contemporary, the *Courrier de Paris*,—a royal decree of Louis the Fourteenth authorized the establishment of a line of "two-

* From the London Athenæum, Sept., 1857. † *Ibid.*

penny-halfpenny" omnibuses; or "Carosses à cinq sous." The company had at its head the Duke de Roanès, and a brace of marquises, and no less a person than the gentle Pascal was among the shareholders. The decree expressly stated that these coaches, of which there were originally seven, each containing eight places, should run at fixed hours, full or empty, to and from certain extreme quarters of Paris, for the benefit of "a great number of persons ill provided for, as persons engaged in law-suits, infirm people, and others, who have not the means to ride in chaise or carriage, which cannot be hired under a pistole or a couple of crowns a day." As the pistole was worth eleven francs, and the crown (écu d'or) was worth five francs fourteen sous, the idea of a two-penny-halfpenny omnibus spread delight throughout the capital. The public inauguration, at seven o'clock on a March morning, of the year 1662, was a grand and gay affair. Three of the "busses" started from the Porte St. Antoine, and four from the Luxembourg. Previous to their setting out, two commissaries of the Châtelet, in legal robes, four guards of the grand provost, half-a-score of city archers, and as many cavalry, drew up in front of the ecstatic people. The commissaries delivered to the latter an address on the advantages of the two-penny-halfpenny carriages, exhorted the riders to observe good order, and then, turning to the coachmen, covered the body of each with a long blue frock, with the arms of the King and the city showily embroidered on the stomach. With this original badge, off drove the coachmen, but throughout the day a provost guard rode in each carriage, and infantry and calvalry, here and there, paraded along the respective lines to keep them clear. For awhile, all Paris strove to ride in these omnibuses, and some stood to gaze impatiently at those who had succeeded better than themselves. The two-penny-halfpenny coach was *the* event of the day, even the *Grand Monarque* tried a trip in one down at St. Germains, and the actors of the Marais played the "Intrigue des Carosses à cinq sous," on their joyous theatre. The wealthier classes seem to have taken possession of them for a considerable time, and it is singular that when they ceased to be fashionable, the poorer classes would have nothing to do with them, and so the speculation failed. The system re-appeared, we may add, in London, under certain modifications, in the year 1820, and as in Paris in 1662, so in London, we brought the new carriage on the stage, and drew peals of laughter and a heavy "half price," by the farce of "The Omnibus; or, a Convenient Distance."

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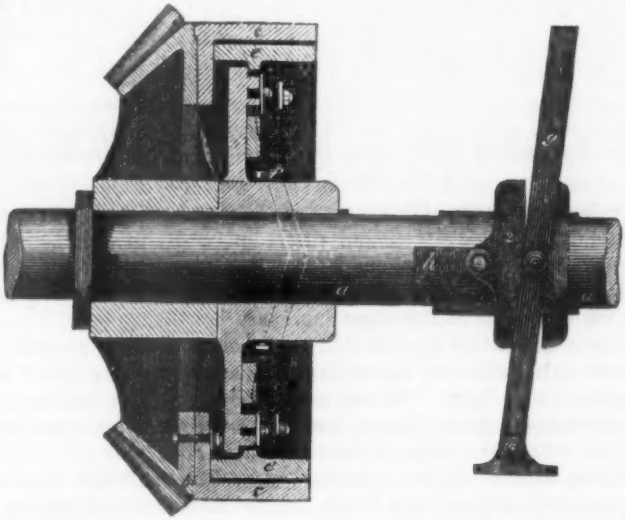
*Wrigley's Improved Friction Coupling for the transmission of Motive Power.**

Mr. Francis Wrigley, of Long Island Iron Works, Carlisle, has patented a highly ingenious arrangement of machinery to be applied, either internally or externally, to a frictional surface on a wheel or disk in motion, by which means it is brought gradually into contact within another and similar surface at rest, and thus held without any other restraining force, and thereby made capable of transmitting any amount of power

* From the Lond. Mech. Mag., Aug., 1857.

from the prime mover to any shafting, gearing, or other machinery requiring to be alternately set in motion or remain at rest. This is accomplished without shock or concussion to any part of the said shafting, gearing, or other machinery.

The accompanying engraving is a sectional view, taken through the centre of the coupling, showing the arrangement of rods, links, lever, and sliding box ; *a*, is the shaft, upon which (when at rest) revolves the bevel wheel, *b*, or other driving wheel or drum, and attached to which is the metallic rim, *c; d, d*, are slots in the flanches of the frictional surface plates, *e, e*, and which surface plates are brought into contact with the rim, *c*, by the rods, *f, f*, shown partly in dotted lines, actuated by the lever, *g*, through the connecting link, *h*, also partly shown in dotted lines, and the grooved boss, *i*, which slides on feathers sunk on the shaft, *a*.



Supposing the driving wheel to be at rest, and it is required to impart an intermittent motion thereto, that is, to stop or start the said wheel at intervals : the wheel is not secured upon the shaft, but fits loosely thereupon, the apparatus for coupling the wheel with the driving power being firmly secured upon and revolving with the said driving shaft. The lever, *g*, is moved forward, either by screw power or otherwise, which causes the boss, *i*, to slide along the shaft, *a*, and by means of the links, *h*, to press the ends of the links, *f, f*, nearest the centre or shaft, into a line, or nearly so, with their extreme centres ; this has the effect of extending the revolving frictional surfaces, *e, e*, and thus bringing these surfaces into contact with the rim, *c*, and imparting motion thereto by the friction created between the said surfaces and the rim, and consequently to the wheel desired to be driven. It will be evident that the wheel may be disconnected from the driving power by reversing this action and withdrawing the fractional surfaces from their rim.

On a Law of Temperature depending upon Lunar Influence. By Mr. J. P. Harrisson.*

The author commenced by saying that, although the question of lunar influence on the atmosphere of our planet was very generally considered as set at rest by the investigations of M. Arago, yet he felt very confident that he was in a position to prove the law he was now about to announce without fear of contradiction. He had reduced and thrown into the form of tables and of curves 280 lunations, with the corresponding mean temperatures; and the laws at which he had arrived were, first, between the first and second octant the temperature immediately after the first quarter, both on the average, and also, with rare exceptions, in each individual lunation is higher than the temperature shortly before the first quarter; secondly, and more particularly, the mean temperature of the annual means of the second day after the first quarter (or the tenth day of the moon's age) is always higher than that of the third day before the first quarter (or the fifth day of the lunation). The tables and curves accompanied the essay, which illustrated these laws at great length.

On the Influence of Metals upon Radiant Heat.† By H. Knoblauch, Prof. Nat. Philos. in Halle.

The principal results of this investigation may be stated to be as follows:

1. Metals, as gold, silver, and platinum, when in thin layers, are to be regarded as diathermanous bodies, which permit a portion of the calorific rays to pass through them; which portion naturally becomes less as the thickness of the layer increases.

In thus transmitting the calorific rays, certain metals, as gold and silver, exercise an elective absorption, similar to that of colored transparent bodies upon light. Others, on the contrary, like platinum, act in the same manner upon all rays, and are therefore to be regarded as analogous to colorless bodies in the case of light.

2. In the case of diffuse reflexion, also, certain metals, such as gold, silver, mercury, copper, and brass, similar to colored and opaque bodies as regards light, exercise an elective absorption upon the calorific rays, in consequence of which the properties of the latter are altered. Others, on the contrary, for example, platinum, iron, tin, zinc, lead, alloy of lead, and tin, German silver, reflect all kinds of calorific rays in the same proportion, exactly as colorless opaque bodies do with regard to light.

The properties which distinguish calorific rays reflected from metals, from unreflected heat, are so far dependent on the source of heat, that differences, for example, which exhibit themselves in a striking manner when solar heat is made use of, are diminished in the case of a Locatelli lamp, and completely disappear when the source of heat is a metallic cylinder not heated to redness.

The surface has the power either of causing the differences to appear in their maximum degree, or to disappear totally, according as the surface produces a diffuse or a regular reflexion.

* From the London Athenæum, Sept., 1857.

† From the Lond., Edin., and Dub. Philos. Mag., Nov., 1857.

The same is true of the change of the angle of incidence. In the case of a rough metallic surface, as the angle of the rays with the surface diminishes, the reflexion passes gradually from the diffuse to the regular, and at the same time the differences between the reflected and unreflected heat also gradually become less, until finally both have exactly the same character.—*Poggendorff's Annalen*, vol. ci., 1857.

Photographing a Drawing upon the Wood on which it is to be Engraved in Relief. Process of M. LALLEMAND.

The wood is first placed with its surface on a solution of alum, and dried; it then receives with a soft brush, a coating composed of animal soap, gelatine, and alum, upon all its faces; when the coating is dry, the surface which is to receive the picture is placed for some minutes in a solution of muriate of ammonia (sal-ammoniac), then dried; then on a bath of nitrate of silver of 20 per cent., and then dried. A clichè upon glass or paper is then applied on the wood by means of a peculiar frame permitting the process of the reproduction to be watched. When satisfactory, the picture is fixed by means of a saturated bath of hyposulphite of soda. A few minutes is enough; it is then washed for only five minutes. The first coating preserves the wood from moisture; and eight months of experience have proved to the inventor that the employment of alum and a hyposulphite, in place of destroying the wood, gives it a great strength favorable to the engraving.—*Comptes Rendus de l'Academie des Sciences* (*Paris*), October, 1857.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, November 19, 1857.

John Agnew, Vice-President, in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Letters were read from Thomas Oldham, Superintendent of the Geological Survey of India, and the Geological Museum, Calcutta, India, and L. A. Huguet-Latour, Esq., Montreal, Canada.

Donations to the Library were received from the Government of India; The Austrian Engineers' Association, Vienna, Austria; L. A. H. Latour, Montreal, Canada; The City of Boston, Mass.; The Hon. J. Holt, Commissioner of Patents, Washington City, D. C.; The American Pharmaceutical Association; Prof. B. Howard Rand, M. de Villeroi, N. F. Jones, Philip Price, James A. Price, Trustees of the Philadelphia Gas Works, and the Mine Hill and Schuylkill Haven Railroad Co., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of November was read.

The Board of Managers and Standing Committees reported their minutes.

New candidates for membership in the Institute (16) were proposed, and the candidate (1) proposed at the last meeting was duly elected.

Ellwood Morris, C. E., exhibited a large drawing of "*Walker's Combined Counter-braced Arch and Truss Bridge.*" This ingenious bridge was designed by Major Robert Walker, Chief Engineer of the North Missouri Railroad, and erected under his direction, at Perruque Creek, (as shown in the drawing,) in two spans of 150 feet each, and at other places. This bridge has proved itself in practice under heavy railroad trains, *to be both strong and stiff in a remarkable degree;* it fulfils all the conditions of a good railroad bridge, and is highly creditable to the professional skill of its projector.

A striking peculiarity in this bridge is shown in the arrangement of the truss rods—these are not only in pairs on each truss, but are divided at the arch, where they separately take hold of a cast iron saddle, so that by acting upon screws cut both on top and bottom of the truss rods, the strains produced by the bridge and its load may at will be thrown either upon the arch, upon the truss, or divided between the two, *so as to bring into play the utmost strength of both.*

Dr. Rand exhibited specimens of parchment paper, prepared by the process published in the *Journal of the Institute*, August, 1857, p. 135.

M. de Villeroi exhibited his "Harmonine," a new musical instrument. It is under consideration by the Committee on Science and the Arts, and will be further noticed in a future number of the *Journal.*

Mr. Howson exhibited a model of a safe for preserving valuables at sea. It consists of a metal vessel composed of an inner and outer casing.

Mr. Howson also exhibited an apparatus for testing the strength of materials, invented by F. C. Lowthorp, Esq., C. E., of Trenton, N. J., and patented in the United States, England, France, and Belgium. The machine is designed for ascertaining the amount of tensile and transverse strain, or torsion or crushing effect which materials are capable of withstanding, and consists in so combining suitable gearing and other mechanism for applying the strains or forces with a piston or plunger, operating against a body of water, or other fluid within a cylinder or barrel, that on applying the force or strain to the object to be tested by means of the gearing, such a pressure shall be transmitted to the fluid in the cylinder or barrel, and to any suitable indicating apparatus in connexion with the same, as to enable the attendant to readily calculate the amount of strain or force to which the object has been submitted.

Mr. Howson remarked that the wrought iron work of the extensive girder bridge over the Jordan River, in Lehigh Co., Pa., was tested by a machine similar to, but on a larger scale than, the one exhibited, and that the machine proved to be most efficient and rapid in its action.

Mr. H. also exhibited a very ingenious automatic rake for harvesters, the invention of S. Comfort, Jr., of Morrisville, Bucks Co., Pa.

ERRATA.

Page 200, line 11 from bottom, for "addition specific heat," read "specific heat when in that state."

201, line 5 & 6 from top, for "water or density," read "water of the same density."

" 13 " "3·576° C.," read "3·576 atmospheres."

" 16 " "(=60 per cent.,)" read "(60° C.)"

Abstract of Meteorological Observations for September, 1857, made in Philadelphia, Somerset, Huntingdon, and Northampton Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

September, 1857.	PHILADELPHIA.—Lat. 39° 57′ 28″ N, Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.								SOMERSET, Somerset Co.—40° N., Lon. 79°3′W. Height about 2750 ft. GEO. MOWRY, Observer						EASTON, Northampton Co.—Lat. 40° 43′N. Lon. 75° 16W. Height above the sea about 320 feet. SELDEN J. COFFIN, Observer.						HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.		
	Barometer.		Thermometer.			Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.	Barometer.		Thermomet'r.		Rain.	Prevail'g winds.	Barometer.		Thermomet'r		Rain.	Prevail'g winds.	Ther.	Rain.	Prevail'g winds.
	Mean.	Mean daily range.	Mean.	Daily range.	Mean daily range.					Mean.	Mean daily range.	Mean.	Mean daily range.			Mean.	Mean daily range.	Mean.	Mean daily range.			Mean.		
	Inch.	Inch.	o	o	o	Per.ct.	Inch	Inches.		Inch.	Inch.	o	o	Inches.		Inch.	o	o	o	Inch.		o	Inch.	
1	30·101	·096	76.2	22	3·8	51	·564		N W.	27·942	·062	63·3	4·6		S.							66·5		S.
2	30·130	·028	75·8	20	1·0	51	·564		S E.	27·956	·005	68·3	5·0		S.	29·810		69·8			W.	68·5		S.
3	30·138	·008	76·5	17	2·0	46	·479		S E.	27·976	·020	66·0	2·3		S S E.	29·810	0·002	69·5	0·3		(var.)	69·0		S.
4	30·124	·014	76·0	18	0·8	41	·437		(var.)	27·955	·021	66·3	1·7		S W.						W.	70·0		S.
5	30·000	·124	78·3	17	2·3	54	·648		(var.)	27·862	·092	67·0	0·7		W.	29·637		73·8			(var.)	73·0		W.
6	29·935	·126	73·2	16	5·2	32	·321		N W.	27·823	·081	61·0	8·0	0·304	N W.						N W.	60·0		N E.
7	30·150	·215	63·8	17	9·3	34	·255		N E.	27·967	·144	52·3	9·3		E.	29·837		56·3			N E.	55·0		E.
8	30·202	·073	63 7	23	1·8	42	·344		(var.)	27·995	·028	53·7	1·3		S.	29·883	0·067	57·0	2·7		(var.)	56·0		S E
9	30·064	·139	68·0	21	4·3	49	·456		S S W.	27·888	·106	59·0	5·3		W.						(var.)	62 5		S.
10	29·973	·090	71·2	25	3·2	49	·533		S W.	27·815	·074	65·3	6 3		S W.	29·617		67·3			(var.)	69·0		S.
11	29·921	·052	75·7	22	4·5	56	·635		S W.	27·781	·033	68·0	2 7		W.						W.	71·5		S.
12	29·894	·028	74·0	20	1·7	60	·676	0·034	(var.)	27·742	·040	67·0	1·0		S S E.	29·573		67·0			E.	73·0		S.
13	29·857	·040	71·3	8	4·0	81	·666	0 011	E.	27·698	·044	71·0	4·0		S E.	29·547	0·040	66·0	3·0		N E.	71·0		E.
14	29·718	·140	76·2	12	4·8	76	·764	0·009	N E.	27·650	·048	69·7	4·0		(var.)	29·397	0·150				(var.)	67·5		E.
15	29·805	·118	74·2	14	2·7	34	·347		N W.	27·774	·124	61·7	8 0		N W.	29·483	0·107	66·3			N W.			N.
16	29·979	·175	68·7	19	5·5	43	·362	0·020	N W.	27·781	·091	58·0	12·3		S.	29 640	0·157	61·5	4·8		W.	67·5		S.
17	29·723	·256	77·0	20	8·3	63	·689		S W.	27·631	·150	75·7	17·7	0·420	W.	29·350	0·283	71·0	9·5		S W.	77·0	0·554	W.
18	29·795	·152	75·8	11	6·2	54	·536		N W.	27·661	·033	69·3	6·3	1 409	W.	29·453	0·170	66·0	9·0		N W.	65·0	0·195	N.
19	29·825	·139	60·0	10	15·8	87	·399	0·524	N E.	27·588	·073	64·0	5·3	0·941	S.	29·530	0·143	48 3	17·7		(var.)	56·5	1·360	N.
20	29·778	·091	61·8	12	5·8	73	·470		N.	27·629	·095	56·0	8·0		W N W	29·420	0 137	57·5	9·2		N W.	56·5		N.
21	29·954	·176	64·7	13	5·0	52	·366		N E.	27·763	·133	51·0	6·3		(var.)	29·620	0·200	54·3	3·2		N.	57·0		S E.
22	29·778	·175	63·5	12	3·5	65	·443	0·513	S E.	27·592	·170	55·0	5·3	0·198	(var)	29·440	0·180	57·0	3·3		S E.	55·0	0·228	S E.
23	29·732	·167	61·5	12	2·0	38	·260		W.	27·613	·062	48·0	7·0		(var.)	29·337	0 197	51·3	6·3		(var.)	50·0		W.
24	29·916	·184	60·7	22	3·5	41	·308		S W.	27·737	·124	51·7	9·0		W.	29·557	0·220	51·7	9·0		W.	55·5		S W.
25	29·938	·032	62·0	20	1·3	45	·339		N W.	27 785	·049	53·3	1·7		N.						N W.	57·0		S.
26	29·943	·030	69·0	26	7·0	50	·477		(var.)	27·853	·068	56 7	3·3		WNW	29·620		59·7			W.	65·0		(var.)
27	29 978	·032	73·7	21	5·3	48	·538		N W.	27·833	·045	59·0	3·0		S W.	29·620	0·060	66·9	6·3		W.	63·5		S W.
28	29·789	·172	69 7	20	4·0	47	·464		W.	27·722	·111	55·7	7·3		W.						W.	57·0	0·017	W.
29	29·927	·138	59 8	14	9·5	33	·201		W N W	27·806	·084	42·3	13·3	0·007	W.						N W.	49·5		N.
30	30·002	·075	53·3	20	6·5	46	·255	0·021	N W.	27·827	·022	41·0	2·7		(var.)	29·653		45·0			W.	48·5		N W.
Mo's	29·936	·109	69·2	17 5	4·7	51	·460	1·132	s 83°w	27·788	·074	60·0	4·8	3·279						1·07			2·454	

Comparison of the Thermometric and Barometric Means of Philada., Northampton, Somerset, and Huntingdon Counties.

Thermometer for August, 1857.

Barometer for August, 1857.

Ins.

EXPLANATION.—

Those marked o—o Somerset County. Those marked +—+ Philadelphia County.

" '—' —Northampton " " <—> Huntingdon "

INDEX.

LIST OF AMERICAN PATENTS, WITH REMARKS, &c.

			Page.
	April, 1857.		
176.	Improvement in Raw Hide Whips,	Charles Bæder,	38
177.	—— Harvesting Machines,	J. F. Barrett,	ib.
178.	—— Binding Grain,		
179.	—— Fire Arms,	Gustav A. Blittkowski,	ib.
180.	—— Constructing Lockets, &c.,	Charles G. Bloomer,	39
181.	—— Side-walk Pavement,	John B. Cornell,	ib.
182.	—— Locks,	Leger Diss,	ib.
183.	—— Gilding and Ornamenting Steel,	Alexander H. Dufresne,	ib.
184.	—— Mortising Stiles on Blind Slats,	D. F. Drake,	ib.
185.	—— Ports in Steam Cylinders,	Bowen Eaton,	ib.
186.	—— Fire Arms,	Josiah Ellis,	ib.
187.	—— Seed Drills,	Ezra Emmert,	ib.
188.	—— Seed Planters,	George M. Evans,	ib.
189.	—— Engrav'g designs on watch cases,	Charles H. Field,	40
190.	—— Ink-stands,	Kingston Goddard,	ib.
191.	—— Action for Grand Pianos,	Daniel F. Haasz,	ib.
192.	—— Indexes to Blank Books,	G. Hodgkinson and T. F. Randolph,	ib.
193.	—— Chronometric Locks,	Amos Holbrook and Henry D. Fish,	ib.
194.	—— Harvester Frames,	M. G. Hubbard,	ib.
195.	—— Photographic Pictures, &c.,	S. Dwight Humphrey,	ib.
196.	—— Saw Gummer,	Oliver B. Judd,	ib.
197.	—— Atmospheric Pumps,	Levi Keiler,	ib.
198.	—— Brushes of Saw Cotton Gins,	Edwin Keith,	ib.
199.	—— Submerged Propelling Wheels,	Thomas Kendall, Sen.,	ib.
200.	—— Harvesters,	Isaiah Knauer,	ib.
201.	—— Street Sprinkler,	Curtis O. Luce,	41
202.	—— Churns,	H. N. Mackey,	ib.
203.	—— Revolving Last Holders,	Benjamin Marshall,	ib.
204.	—— Guiding Boxes of Oil Presses,	Wm. W. Marsh,	ib.
205.	—— Photographic Baths and Pans,	George Mathiot,	ib.
206.	—— Canisters for Putting up Paint,	John W. Masury,	ib.
207.	—— Cop Tubes,	John Marland and Earlsworth Crocket,	ib.
208.	—— Sails and Rigging of Vessels,	George T. May,	ib.
209.	—— Washing Machines,	Josiah Mayes,	ib.
210.	—— Tempering Steel Plates,	Henry A. Seymour,	42
211.	—— Bomb Lances,	Rufus Sibley,	ib.
212.	—— Excavator,	Samuel W. Soule,	ib.
213.	—— Tenoning Blind Slats,	La Fayette Stevens,	ib.
214.	—— Sack-holders,	Augustus Stoner,	ib.
215.	—— Letters for Signs, &c.,	Thomas Motley,	ib.
216.	—— Wind-Mill,	Rufus Nutting,	ib.
217.	—— Sett'g Head Blocks of Saw-mills,	Ira Robbins,	ib.
218.	—— Planing Hoops,	Thaddeus S. Scoville,	ib.
219.	—— Winding Wadding,	Thomas Thompson,	ib.
220.	—— Railroad Chair Machines,	Corydon Winch,	ib.
221.	—— Skates,	John A. Winslow,	43
222.	—— Washing Machines,	Henry D. Young,	ib.
223.	—— Purifying Oils,	Halvor Halvorson, and others,	ib.
224.	—— Anchor Trippers,	J. B. Holmes, ass'd to self & J. R. Pratt,	ib.
225.	—— Chisels of Mortising Machines,	M. Marshall, ass'd to self and R. Dyer,	ib.
226.	—— Making Paper Bags,	Benjamin F. Rice, and others,	ib.

227. Improvement in Gauges for Casks, John W. Cochran, . 43
228. —— Splitting Wood, . Waterman L. Ormsby, . 44

ADDITIONAL IMPROVEMENTS.

1. Improvement in Filters, . David N. B. Coffin, Jr., . 44
2. —— Safety Hatches for Ware-houses, Wm. H. Thompson and E. P. Morgan, ib.

RE-ISSUES.

1. Improvement in Sawing Machines, Samuel R. Wilmot, . . 44
2. —— Carpenters' Gauges, . Joel Bryant, . . ib.
3. —— Reaping Machines, .
4. —— " " . } Obed Hussey, . . ib.
5. —— " " .
6. —— Sewing Machines, . } Joseph P. Martin, Assignee of John A.
7. —— " " . } Bradshaw, . 45
8. —— Looms, . . Warren W. Dutcher, . ib.
9. —— Refrigerators, . D. W. C. Sandford, . ib.
10. —— Hinge for Picture Cases, . A. P. Critchlow & Co., . ib.
11. —— Seed Drills, . James Selby, . . ib.
12. —— Saw-mill for Re-sawing Boards, Pearson Crosby, . . 46
13. —— Gas Burners, . Charles H. Johnson, . ib.

DESIGNS.

1. For Iron Railings, . Robert Wood, . . 46
2. — Plates of Stoves, . A. C. Barstow, . ib.
3. — Clock Cases, . Elias Ingraham, . . ib.
4. — Clock Case Fronts, . Chauncey Jerome, . ib.
5. — Plates of Cooking Stove, N. S. Vedder, ass'd to Smith & Sheldon, ib.

May, 1857.

1. Improvement in Sewing Machines, Bryan Atwater, . . 46
2. —— Screw Cutting Machine, . Wm. N. Adams, . 47
3. —— Stuffing Boxes, . N. R. Bates, . . ib.
4. —— Looms for weaving pile Fabrics, Erastus B. Bigelow, . ib.
5. —— Cutting Veneers, . Gilbert Bishop, . . ib.
6. —— Pole for Carriages, . Sherlock H. Bishop, . ib.
7. —— Boats for Duck Shooting, . Robert Bogle, . . ib.
8. —— Picker Motion for Looms, Samuel Boorn, . ib.
9. —— Print'g Names on Newspapers, Stephen D. Carpenter, . ib.
10. —— Surgical Splint Apparatus, . J. H. H. and Wm. J. Burge, 48
11. —— Swells for Melodeons, &c., Jeremiah Carhart, . ib.
12. —— Nut Machines, . Richard H. Cole, . . ib.
13. —— Vault Covers, . } John B. Cornell, . ib.
14. —— " . }
15. —— Pistons for Steam Engines, George W. Cotton, . . ib.
16. —— Field Fence, . Ezra Cole, . . ib.
17. —— Opening and Closing Gates, Solomon Cole, . . ib.
18. —— Rotary Brick Machines, . George Crangle, . ib.
19. —— Door Bolt, . Jeremiah M. Crosby, . ib.
20. —— Reaping and Mowing Machines, Charles Crook, . 49
21. —— Omnibus Coffer, . Joseph T. Curtis, . . ib.
22. —— Straw Cutters, . E. G. Cushing, . ib.
23. —— Feed-water Apparatus, . Peter S. Ebbert, . . ib.
24. —— Ice cutt'g attachments to vessels, Thomas Estlack, . ib.
25. —— Panels of Field Fences, . Isaac D. Garlick, . ib.
26. —— Ploughs, . Thomas C. Garlington, . ib.
27. —— " . . Jackson Gorham, . . ib.
28. —— Locomotive Engines, Horace Gray, . ib.
29. —— Purifying Gutta-Percha, . Robert Hæring, . . ib.
30. —— Exhaust of Locomotives, Robert Hale, . . ib.
31. —— Chain Pumps, . James Harrison, Jr., . 50
32. —— Violin Attachment, . Andrew Hett, . ib.
33. —— Bed & gauge to regulate tenon'g, D. Hodges, . . ib.

34.	Improvement in Brick Machines,	Joseph W. Jayne,	50
35.	—— Cotton Seed Planters,	Henry L. Justice & John H. Galbreath,	ib.
36.	—— Transmitting Motion,	Mathaus Kæfer,	ib.
37.	—— Cutting and Binding Grain,	Hiram Kellogg,	ib.
38.	—— Turning the Edges of Cloth,	John P. Marston,	ib.
39.	—— Pocket Safes and Fastenings,	George R. McIlroy,	ib.
40.	—— Feed Motion for Sawing Mills,	Daniel and Angus A. Methven,	ib.
41.	—— Napping Cloth,	John C. Miller and Charles N. Tyler,	ib.
42.	—— Ships' Hawse Holes,	R. R. Osgood, ass'd to J. C. Osgood,	ib.
43.	—— Wrenches,	Charles Pinder,	51
44.	—— Buckets of Weighing Machines,	Rufus Porter,	ib.
45.	—— Coupling for Shafting,	Wm. and Coleman Sellers,	ib.
46.	—— Preparing Green Sand Marl,	Charles Stearnes,	ib.
47.	—— Piano-forte Action,	Henry Steinway,	ib.
48.	—— Rollers for Printing Fabrics,	Richard F. Sturges,	ib.
49.	—— Clothes Pounder,	Sardis Thompson,	ib.
50.	—— Ladies' Skirts,	Helen C. Traphagen,	ib.
51.	—— Door Sill and Door Strip,	Henry Tryon,	ib.
52.	—— Blind Fastenings,	Horace Vansands,	ib.
53.	—— Combing Wool,	Cullen Whipple,	ib.
54.	—— Making India-Rubber Belting,	Robert Hale,	52
55.	—— Photographic ground for engravers,	Robert Price,	ib.
56.	—— Sleighs and Cutters,	Lewis B. Randall,	ib.
57.	—— Fire Arms,	John B. Read,	ib.
58.	—— Stair Steps,	Charles Robinson,	ib.
59.	—— Close or Open Stoves,	Henry Seitz,	ib.
60.	—— Locks,	Alfred Williams and E. P. Cummings,	ib.
61.	—— Gate of Turbine Wheels,	L. M. Wright,	ib.
62.	—— Securing Hubs to Axles,	Leonard J. Worden,	ib.
63.	—— Brick Machines,	James Hotchkiss and others,	ib.
64.	—— Cutter for turning wooden boxes,	Henry Mellish, ass'd to Charles Pope,	ib.
65.	—— Railroad Car Wheels,	G. W. Alden,	88
66.	—— Heating and Cooking by Gas,	R. Snowden Andrews,	ib.
67.	—— Self-indicating Balance,	Z. W. and O. Avery,	ib.
68.	—— Signal Lamps,	R. P. Bailey,	ib.
69.	—— Rotary Shingle Cutter,	Wm. Bevard,	ib.
70.	—— Stitch for Sewing Machines,	C. F. Bosworth,	ib.
71.	—— Portable Barrack,	M. F. Brantingham,	ib.
72.	—— Corn Planters,	John Broughton,	ib.
73.	—— Roasting Meat,	John G. Brown and John P. Derby,	ib.
74.	—— Seed Planters,	John H. Bruen,	ib.
75.	—— Windage in Fire Arms,	Ambrose E. Burnside,	89
76.	—— Making Lozenges,	Oliver R. and Silas Edwin Chase,	ib.
77.	—— Cutting Match Splints.	Thomas Cook,	ib.
78.	—— Artificial Honey,	Zenas Corbin and Gideon Marlett,	ib.
79.	—— Horse Shoes,	David Cumming,	ib.
80.	—— Hook Temples for Looms,	Warren W. Dutcher and George Draper,	ib.
81.	—— Bridle Bits,	Kasson Frazer,	ib.
82.	—— Corn Huskers,	E. F. French,	ib.
83.	—— Portable Houses,	Daniel Fitzgerald,	ib.
84.	—— Semi-rotative Steam Engines,	C. B. Gallagher,	90
85.	—— Needles for Sewing,	Benjamin Garvey,	ib.
86.	—— Nail Plate Feeder,	John C. Gould,	ib.
87.	—— Hemp Brakes,	J. Locke Hardeman,	ib.
88.	—— Seed Planters,	John Haselton,	ib.
89.	—— Propeller Blades,	George Hibsch,	ib.
90.	—— Harvesters,	Moses G. Hubbard,	ib.
91.	—— Presses for Cotton, &c.,	Henry Hughes,	ib.
92.	—— Treating Raw Cotton,	Julius C. Hurd,	ib.
93.	—— Harvesters,	Moses G. Hubbard,	ib.
94.	—— Folding Bedsteads,	James A Johnson,	ib.
95.	—— Bed Bottoms,	J. F. Keeler,	ib.

96.	Improvement in Coal Stoves,	John C. Keller,	90
97.	—— Blacksmiths' Striker,	Hartwell Kendall,	ib.
98.	—— Mortising Chisel,	George P. Ketcham,	91
99.	—— Joiners' Plane,	Benjamin I. Lane,	ib.
100.	—— Cartridges,	Edward Lindner,	ib.
101.	—— Bor'g flue sheets of steam boilers,	Sylvanus V. Lowe,	ib.
102.	—— Guard of Grain Elevators,	George Mann, Jr.,	ib.
103.	—— Engraving Cylinders,	Robert Muckeit and Wm. Rigby,	ib.
104.	—— Blasting Powder,	Antoine Murtineddu,	ib.
105.	—— Joiners' Bench Strip,	Charles T. Pearson,	ib.
106.	—— Locks,	Stuart Perry,	ib.
107.	—— Coal Cracker,	Townsend Poore,	ib.
108.	—— Devulcanizing India-Rubber,	C. Poppenhusen and Ludwig Held,	ib.
109.	—— Piano-forte Bridge,	Thomas E. Power,	92
110.	—— Trap for Animals,	Frederick Reuthe,	ib.
111.	—— Fountain Pens,	Charles A. Rosefield,	ib.
112.	—— Binding Books,	Archibald H. Rowand,	ib.
113.	—— Bumper Railroad Car Brakes,	Louis Bruner,	ib.
114.	—— Planing Chair Seats,	Edward Q. Smith,	ib.
115.	—— Heating Solder'g Tools by Gas,	J. Henry Stimpson,	ib.
116.	—— Portable Field Fence,	Seth C. Tufts,	ib.
117.	—— Soap for Scouring Woolens,	Louis Wilman,	ib.
118.	—— Rock Drills,	John D. Hope, ass'd. to G. A. Gardner,	ib.
119.	—— Seed Planters,	Charles Ketchum, ass'd to C. G. Judd,	ib.
120.	—— Sub-marine Excavator,	Wm. Kennish, ass'd to A. B. Gray,	ib.
121.	—— Copying Presses,	W M Smith, ass'd to self & P. Hannay,	93
122.	—— Prepar'g canvass for print'g, &c.,	Elisha Lee,	ib.
123.	—— Gas Generators,	James A. Bruce, ass'd to Md. Gas Co.,	ib.
124.	—— Cordage Machines,	James P. Arnold,	ib.
125.	—— Port-folios,	Robert Arthur,	ib.
126.	—— Projectiles,	Christopher C. Brand,	ib.
127.	—— Dressing Pieces of Lumber,	Harvey Brown,	ib.
128.	—— Hand Truck,	Ze Butt,	ib.
129.	—— Dogging Lumber,	D. N. B. Coffin, Jr., N. & H. D. Stover,	ib.
130.	—— Dipped Matches,	Thomas Cook,	ib.
131.	—— Gas Regulators,	Robert Cornelius,	94
132.	—— Treat'g straw braid for hats, &c.,	George Cornwall, 2d,	ib.
133.	—— Piano-forte Actions,	Spencer B. Driggs,	ib.
134.	—— Gunpowder,	Lammot Dupont,	ib.
135.	—— Blanket for Calico Printing,	John Fallon,	ib.
136.	—— Shuttle Motion for Looms,	Levi Ferguson,	ib.
137.	—— Violins,	Bradley Fitts,	ib.
138.	—— Cleaning Grain,	J. R. Gates,	ib.
139.	—— Re-dressing Mill-Stones,	W. Y. Gill,	ib.
140.	—— Pumps,	Silas Hewit,	ib.
141.	—— Grain and Grass Harvesters,	John H. Keyser & Edward M. Mobley,	ib.
142.	—— Making Wash-boards,	Edward and Britain Holmes,	ib.
143.	—— Removing Photographs,	Edward Howell,	95
144.	—— Fastening Sheet Metal on Roofs,	A. Johnson, Assignor to self and others,	ib.
145.	—— Joiners' Plane,	James Lashbrooks,	ib.
146.	—— Friction Rollers,	William H. Main,	ib.
147.	—— Dressing Sewing Thread, &c.,	J. D. Minder,	ib.
148.	—— Approach Opening Gate,	George W. McGill,	ib.
149.	—— Reducing Zinc Ores,	Alfred Mounier,	ib.
150.	—— Running Gear of Carriages,	Richard Murdoch,	ib.
151.	—— Apparatus for Raising Water,	Andrew Nicol,	ib.
152.	—— Basin Faucet,	Erastus Stebbins,	ib.
153.	—— Rotary Planing Cutter,	Henry D. Stover,	96
154.	—— Lifting Jack,	William Thomas,	ib.
155.	—— Shirt Stud or Button,	Wm. Voght and John J. Klink,	ib.
156.	—— Allowing play to arbors of Saws,	Harvey R. Wolfe,	ib.
157.	—— Centrifugal Battery,	Albert Potts,	ib.

158. Improvement in Stencil Plate Print'g, Samuel T. Sanford, . . 96
159. —— Compressing Blind Slats . Luther T. Smart, . ib.
160. —— Safety valves in Steam Boilers, G. P. Clarke, ass'd to self & W. M Littell, ib.
161. —— Indicating the Speed of Vessels, David Hinman, and others, . ib.
162. —— Printing in Colors, . Wm. Croome, . ib.
163. —— Mowing Machines, . T. Harding, ass'd. to Warder & Brokaw, ib.
164. —— Lantern and Oil Can, W. G. Russell, ass'd to self & W. Sewell, ib.
165. —— Folding Paper, . Edward N. Smith, ass'd to S. S. Bacon, 97
166. —— Looms, . . Nathaniel B. Carney, and others, . ib.
167. —— Spring Hinge, . Dr. Joseph S. Smith, . ib.
168. —— Fire Alarm Telegraph for Cities, W. F. Channing and M. G. Farmer, ib.
169. —— Shingle Machine, . C. M. Young, . . 98
170. —— Spinal Corsets, . Alanson Abbé, . ib.
171. —— Mowing and Reaping Machines, Amory Amsden, . . ib.
172. —— Vehicles, . . Charles Atkinson and G. S. Manning, ib.
173. —— Revolving Fire Arms, Fordyce Beals, . ib.
174. —— Griddles, . Wm. Bennett, . . ib.
175. —— Hand Seed Planters, . Silas P. Briggs, . ib.
176. —— Grain Scourers and Separators, Samuel Canby, . . ib.
177. —— Cutt'g and Bend'g Sheet Metal, Elias F. Coates, . ib.
178. —— Reefing Top-sails, . James E. Cole, . . ib.
179. —— Sewing Machines, . Solomon B. Ellithorp, . 99
180. —— Harvesting Machines, Ralph Emerson, Jr., . . ib.
181. —— Curtain Rollers, . Chandler Fisher, . ib.
182. —— Wagon Couplings, . W. D. Guseman, . . ib.
183. —— Bomb Lance, . Julius Grudchos and Selmar Eggers, ib.
184. —— Cooking Stoves, . Joseph Hackett, . ib.
185. —— Printing Presses, . Gordon McKay, . . ib.
186. —— Sugar Boiling Apparatus, . Adolph Hammer, . ib.
187. —— Ink-Stands, . Bennett J. Heywood, . ib.
188. —— Ore Crushing Machines, . Samuel F. Hodge, . ib.
189. —— Looms, . Wm. H. Howard, . . ib.
190. —— Discharg'g Horse from Carriage, Gilbert Hubbard, . ib.
191. —— Washing Machines, . Abraham Huffer, . . 100
192. —— Shingle Machine, . Wm. A. Jarrett, . ib.
193. —— Reels for Yarn or Thread, . Christian Knauer, . . ib.
194. —— Corn Planters, . Robert Kuschke and Peter Merkel, ib.
195. —— Siz'g compositions for yarns, &c., John Leigh, . . ib.
196. —— Fire Arms, . . Edward Lindner, . . ib.
197. —— Testing Strength of Materials, Francis C. Lowthrop, . ib.
198. —— Wind-Wheel, . James Mitchell, . . ib.
199. —— Ore Washer, . Pierre P. Martin, . ib.
200. —— Repeating Fire Arm, Wm. W. Marston, . . 101
201. —— Making Paper Pulp, Marie A. C. Mellier, . ib.
202. —— Manufacture of Iron and Steel, Robert Mushet, . . ib.
203. —— Brick Machines, . Stephen Parks, . ib.
204. —— Cotton Cultivators, . Alex. A. Roberts and Baldwin Davis, ib.
205. —— Fertilizing Compounds, Louis S. Robbins, . . ib.
206. —— Making Stove Pipe, . M. C. Root, . . ib.
207. —— Compressing Gaseous Bodies, Wm. A. Boyce, . . ib.
208. —— Bit for cutt'g out plugs of wood, Cyrus W. Saladee, . ib.
209. —— Examining Vessels' Keels, . James E. Simpson, . . ib.
210. —— Corn Planters, . F. J. Smith, . . ib.
211. —— Cutting Grooves and Slots, Robert F. Underhill, . ib.
212. —— Tanning Apparatus, . Otis B. Wattles, . 102
213. —— Sewing Machines, . Thomas S. Wells, . . ib.
214. —— Thermo-pneumatic Safety valve, S. H. Whitaker and Ezra Cope, ib.
215. —— Seed Planters, . Jesse Whitehead, . ib.
216. —— Compound Gauge, . Albert Williams, . . ib.
217. —— Looms, . . F. Painter, ass'd to the N. Man. Co., ib.
218. —— Printing Presses, . S. D., Assignor to A. C. Learned, . ib.

219.	Improvement in Burglars' Alarms,	D. Coon, ass'd to self & F. Chesborough,	102
220.	—— Projectile for Killing Whales,	Rufus Sibley, ass'd to C. C. Brand,	103
221.	—— Cutting Boot and Shoe Soles,	Stephen Thurston, ass'd to self & others,	ib.
222.	—— Tips for Sugar Moulds,	John Turl, assigned to Samuel Turl,	ib.
223.	—— Securing Nuts on Axles,	T W Williams ass'd to self & H T Hoyt,	ib.
224.	—— Drop Presses,	Milo Peck,	ib.

RE-ISSUES.

1.	Improvement in Turn Tables,	Jacob C. Robie,	103
2.	—— Looms for Weaving Carpets, &c.,	Erastus B. Bigelow,	ib.
3.	—— Polishing Metallic Surfaces,	Richard M. Hoe,	ib.
4.	—— Hanging Shafts in Mills,	Joseph Bancroft, ex'r of E. Bancroft,	104
5.	—— Drying and Pressing Paper,	John North,	ib.
6.	—— Draft Accelerator for Steamers,	Peter C. Guiou,	ib.

DESIGNS.

1.	For Stoves,	Jacob Steffe, and others,	104
2.	—— Cooking Stoves,	Jacob Beesely, and others,	ib.
3.	—— Stoves,	Russell Wheeler and Stephen A. Bailey,	ib.
4.	—— Churns, Egg Beaters, &c.,	John S. Gallagher, Jr.,	ib.
5.	—— Picture Frames,	A. P. C. Boute,	ib.
6.	—— Furnaces,	Willis S. Bronson,	ib.
7.	—— Stoves,	Garretson Smith, and others,	ib.

June, 1857.

1.	Improvement in Door Lock,	Thomas B. Atterbury,	169
2.	—— Sleeve Fasteners,	Wm. A. Bates,	ib.
3.	—— Skates,	R. W. Belson,	ib.
4.	—— Hydrant,	Wm. W. Binny,	ib.
5.	—— Fastenings for Garments,	Jeremy W. Bliss,	170
6.	—— Mowing Machines,	Silas P. Briggs,	ib.
7.	—— Printing Presses,	Jason L. Burdick,	ib.
8.	—— Door Hinge,	S. M. Bullard,	ib.
9.	—— Fibre of Banana, Plantain, &c.,	Francis Burke,	ib.
10.	—— Hanging Mill Stones,	Wm. A. Clark, and others,	ib.
11.	—— Pack'g pistons of steam engines,	Patrick Clark,	ib.
12.	—— Steam Pumping Apparatus,	George H. Corliss,	ib.
13.	—— Lock,	Julius M. Cook,	ib.
14.	—— Water-Wheel,	Reuben Daniels,	ib.
15.	—— Sewing Machines,	James E. A. Gibbs,	ib.
16.	—— Potato Diggers,	Isaac Griffen,	ib.
17.	—— Ploughs,	John S. Hall,	171
18.	—— Block for black'g boots & shoes,	Francis G. Harding,	ib.
19.	—— Hand Saws,	Michael Kennedy,	ib.
20.	—— Faucet,	Lucius J. Knowles,	ib.
21.	—— Life Preservers,	James Knight,	ib.
22.	—— Feeding Gas Generators,	C. B. Loveless,	ib.
23.	—— Locomotive Boilers,	J. E. McConnell,	ib.
24.	—— Scroll Sawing Machine,	John J. Curtis,	ib.
25.	—— Sowing Seed Broad-cast,	Daniel Haldeman,	ib.
26.	—— Screws of Thin Metal,	John L. Mason,	ib.
27.	—— Harvesting Hemp,	John B. McCormick,	172
28.	—— Atmospheric Churn,	Robert McCutcheon,	ib.
29.	—— Sowing Seed Broad-cast,	A. C. Miller,	ib.
30.	—— Paring Horses Hoofs,	V. N. Mitchell,	ib.
31.	—— Cast Iron Car Wheels,	Albert L. Mowry,	ib.
32.	—— Fluid Metre,	James R. Maxwell,	ib.
33.	—— Churns,	Henry C. Nicholson,	ib.
34.	—— Leather Shoe Binding,	Eugene L. Norton,	ib.
35.	—— Feeding Grain to Mill Stones,	Milton and Charles Painter,	ib.
36.	—— Hydraulic Gas Generator, }	August F. W. Partz,	173
37.	—— Condensing Vapors and Gases, }		
38.	—— Oscillating Printing Presses,	Charles Potter, Jr.,	ib.

39.	Improvement in Seed Planters,	Silas G. Randall,	173
40.	—— Harvesters,	Wm. T. B. Read,	ib.
41.	—— Making Shovels,	David B. Rogers,	ib.
42.	—— Die Stock,	John F. Scharer,	ib.
43.	—— Cross-cut Sawing Machine,	Stephen Scotton,	ib.
44.	—— Cutting Heels of Boots, &c.,	John Shaw,	ib.
45.	—— Cooking Ranges,	Charles J. Shephard,	ib.
46.	—— Printers' Composing Sticks,	James and Wm. Tidgewell,	174
47.	—— Filing Saws for Cotton Gins,	Jonathan T. Turner,	ib.
48.	—— Uniting panels of portable fences,	Charles Van De Mark,	ib.
49.	—— Folding Bedsteads,	John B. Wickersham,	ib.
50.	—— Hat Stands,		
51.	—— Plough Clevis,	J. D. Willoughby,	ib.
52.	—— Printing Presses,	Daniel K. Winder,	ib.
53.	—— Door Bolt,	Amos Westcott,	ib.
54.	—— Wood Gas Generators,	Charles F. Werner,	ib.
55.	—— Separat'g husks from ears of corn,	Isaac N. Whitaker,	ib.
56.	—— Dressing water furrows in land,	Jesse Whitehead,	ib.
57.	—— Pickers for Looms,	T. J. Mayall, ass'd to self & G. N. Davis,	ib.
58.	—— Hominy Machines,	O. F. Mayhew, ass'd to self & W H. Weeks,	175
59.	—— Holders for Sad Irons, &c.,	L. Londinsky, as'd to self & A E Becker,	ib.
60.	—— Splitting Leather and Hides,	I. Lippmann, ass'd to M. J. A. Guiet,	ib.
61.	—— Water Gauges for Steam Boiler,	D. E. Rugg, ass'd to self & D. N. Force,	ib.
62.	—— Prevent Counterfeiting Notes,	Christopher D. Scropyan, ass'd to others,	ib.
63.	—— Door Bolts,	S. R. Wilmot, ass'd to S. B. Guernsey,	ib.
64.	—— Dies for Punching Fork Tines,	Le Roy S. White, ass'd to others,	ib.
65.	—— Ploughs,	John Ormiston, ass'd to D. N. Allard,	ib.
66.	—— Blotter,	R. G. Allerton,	ib.
67.	—— Repairing Railroad Bars,	Lyman Beebe and George F. Smith,	ib.
68.	—— Holding the Bit in the Brace,	George Benjamin,	176
69.	—— Rounding and Backing Books,	Theodore Bergner,	ib.
70.	—— Covering Insulated wire with lead,	Samuel C. Bishop,	ib.
71.	—— Grooving Stove Pipe,	Charles Bigelow,	ib.
72.	—— Steam Heating Stove,	Asa Blood,	ib.
73.	—— Paring, Coring, &c., Apples,	Charles F. Bosworth,	ib.
74.	—— Metallic Fastening for Bales, &c.,	Asa O. Broad,	ib.
75.	—— Self-loading Cart,	J. S. Brown,	177
76.	—— Manufacturing Felt Cloth,	Thomas B. Butler,	ib.
77.	—— Carpet Fastenings,	David N. B. Coffin, Jr.,	ib.
78.	—— Drying Paste-board or Paper,	Patrick Clark,	ib.
79.	—— Catch for Doors,	Jeremiah M. Crosby,	ib.
80.	—— Railroad Switch Lock,	Wm. L. Cawthron,	ib.
81.	—— Bakers' Ovens,	John Chilcott,	ib.
82.	—— Rope Machines,	Wm. R. Dutcher,	ib.
83.	—— Roofing Machines,	J. B. Driscole,	ib.
84.	—— Grain Separators,	Elishu Dowd,	ib.
85.	—— Card Printing Press,	Charles E. Emery,	ib.
86.	—— Making Horse Shoe Nails,	Calvin Carpenter, Jr.,	178
87.	—— Self-acting Wagon Brake,	M. C. Chamberlain,	ib.
88.	—— Mitre Box,	George L. Chapin,	ib.
89.	—— Prepar'g hub blocks for the lathe,	Lovett Eames,	ib.
90.	—— Melodeons,	Wm. Evans,	ib.
91.	—— Making Wrought Nails,	Smith Gardiner,	ib.
92.	—— Guiding &c., Puppet Valves,	Joseph Hyke and Wm. Stearns,	ib.
93.	—— Frame for Camp Tents,	Benjamin Hinckley,	ib.
94.	—— Clay Pulverizers,	Ira Hersey and J. H. Van Riper,	ib.
95.	—— Carriage Brakes,	George Hauck,	ib.
96.	—— Solar Lamps,	Joseph Hassell,	179
97.	—— Sewing Machines,	Daniel Harris,	ib.
98.	—— Wheelwrights' Machine,	E. N. Kilpatrick,	ib.
99.	—— Coal Stoves,	John B. Kohler,	ib.

100.	Improvement in Basin Faucet,	Wm. C. Marshall and H. W. Smith,	179
101.	—— Felling Trees by Hand,	Elliot T. Miller,	ib.
102.	—— Mode of Hanging Doors,	Albert W. Morse,	ib.
103.	—— Portable Fence,	Wm. Morrison,	ib.
104.	—— Construct'g watch & locket rims,	Henry A. Phillips,	ib.
105.	—— Rotary Pumps,	Robert Ramsden,	ib.
106.	—— Automatic Fans,	Lawrence Rebstock and M. Reimel,	ib.
107.	—— Guide for Circular Saws,	George W. Rodeboy,	180
108.	—— Making Lamp Black,	Julius A. Roth,	ib.
109.	—— Adjusting Circular Saws,	Gardner R. Scriven,	ib.
110.	—— Carriage Wheel,	James D. Sarven,	ib.
111.	—— Hob for cutting Screw Chasers,	Gottlob C. Schneider,	ib.
112.	—— Nail Machine,	Elhanan W. Scott and Ammi M. George,	ib.
113.	—— Boots,	James Scrimgeour,	ib.
114.	—— Steering Apparatus for Ships,	Phineas Smith,	ib.
115.	—— Paper File,	D. A. Stiles,	ib.
116.	—— Mop-Head,	Edward P. Thompson,	ib.
117.	—— Stump Extractor,	Peter Traxler,	181
118.	—— Road Scraper,	Hiram Van Pelt,	ib.
119.	—— Gas Burners,	John C. Walsh,	ib.
120.	—— Wrench,	Edward J. Worcester,	ib.
121.	—— Setting Tires on Wheels,	John H. Williams,	ib.
122.	—— Damper regulator for S. Boiler,	Patrick White,	ib.
123.	—— Nut Machine,	Samuel H Whitaker,	ib.
124.	—— Folding Paper,	James F. Weeks,	ib.
125.	—— Cheese Hoops,	C. P. S. Wardwell,	ib.
126.	—— Automatic Saw-Mill Blocks,	Hiram Wells,	182
127.	—— Incasing Hydrants,	Wm. Barnwell, ass'd to S. P. Ayres,	ib.
128.	—— Arra'ment for basin, &c., cocks,	E P Burnham as'd to self & H A Chapin,	ib.
129.	—— Fire Grates for Fire Pots,	D. H. Dean, ass'd to W. T. Coggeshall,	ib.
130.	—— Tonguing & groov'g hand plane,	P A Gladwin as'd to self & T F Caldicott	ib.
131.	—— Forging Horse Shoe Nails,	R. Cook, ass'd to self and S. Norton,	ib.
132.	—— Power Printing Presses,	J. Morse, ass'd to Ruggles' Press Co.,	ib.
133.	—— Pegging Boots and Shoes,	B F Sturtevant, as'd to self & Townsend,	ib.
134.	—— Carpet Bags,	J. Zepfel, ass'd to self & J. B. Radley,	183
135.	—— Brick Presses,	R. R. Harbour,	ib.
136.	—— Mould-boards for Ploughs,	Henry S. Akins,	ib.
137.	—— Brine Evaporators,	Charles W. Atkinson,	ib.
133	—— Card Printing Presses,	Franklin L. Bailey,	ib.
139.	—— Laths for Buildings,	John L. Brabyn,	ib.
140.	—— Safety Attachm't for Hatchways,	James Bridge,	184
141.	—— Hydrant,	Joel Bryant,	ib.
142.	—— Stock for Bench Planes,		
143.	—— Knife for Splitting Leather,	Dexter H. Chamberlain,	ib.
144.	—— Harvesters,	Nicholas Clute,	ib.
145.	—— Cork Machine,	Edward Conroy,	ib.
146.	—— Roller Temple for Looms,	Warren W. Dutcher,	ib.
147.	—— Making Axe Polls,	Richard H. Cole,	ib.
148.	—— Invalid Bed Elevators,	D. Stringham Dunning,	ib.
149.	—— Steam Pressure Gauges,	Joseph L. Eastman,	185
150.	—— Making Cast Iron Malleable,	A. K. Eaton,	ib.
151.	—— Depilat'g compound for Hides,		
152.	—— Screw Cutter,	James M. Evarts,	ib.
153.	—— Butter Workers,	Charles W. Gage,	ib.
154.	—— Preserving Rolling Contact,	George P. Gordon and F. O. Degener,	ib.
155.	—— Corn Planters,	Ives W. McGaffey,	ib.
156.	—— Chairs for Invalids,	James G. Holmes,	ib.
157.	—— Seed Planters,	Solomon T. Holly,	ib.
158.	—— Bedsteads,	Peter Hinds,	ib.
159.	—— Animal Traps,	Henry Hackman, Jr.,	ib.
160.	—— Sewing Machines,	Daniel Harris,	ib.
161.	—— Rudders,	Robert S. Harris,	186

162.	Improvement in Safety Pockets, .	Horace Harris, . .	186
163.	—— Construction of Gas Generators,	Augustus A. Hayes, .	ib.
164.	—— Cutt'g Apparatus of Harvesters,	M. G. Hubbard. . .	ib.
165.	—— Scouring and Setting Leather,	Peter E. Hummel, .	ib.
166.	—— Ploughs, . .	Charles B. Ingersoll, .	ib.
167.	—— Foot Stove, .	John W. Lefferts, .	ib.
168.	—— Ploughs, . .	Erasmus D. and Leander W. Legg,	ib.
169.	—— Railroad Snow Excavators,	S. Y. Ludlum, . .	ib.
170.	—— Sowing Grain in Drills, .	Frederick Moehlmann, .	ib.
171.	—— Corn Planters, .	Wm. T. Pepper, . .	187
172.	—— Valve connexions for S. Engines,	Benjamin L. Phillips, .	ib.
173.	—— Corn Planters, .	Sylvanus Richardson, .	ib.
174.	—— Valve Gear of Steam Engines,	Samuel Swartz, .	ib.
175.	—— Condens'g apparatus for Salt,	John C. Fr. Salomon, .	ib.
176.	—— Postage Stamp & Label Sticker,	Coleman Sellers, .	ib.
177.	—— Refrigerators, .	John C. Schooley, . .	ib.
178.	—— Bending Sheet Metal Pans, }	E. A. Smead, .	ib.
179.	—— Wiring Tin Pans, . }		
180.	—— Gang Ploughs, .	Joseph Sutter, . .	ib.
181.	—— Propeller Canal Boats, .	George W. Swartz, .	188
182.	—— Elevat'g water by compressed air,	Archibald Thomson, .	ib.
183.	—— Cultivator Ploughs, .	Micajah Tolle,	ib.
184.	—— Excavating Machines, .	Alonzo Taggart, . .	ib.
185.	—— Smut Machines, .	James Tompkins, .	ib.
186.	—— Mowing Machines, .	Jeremy B. Wardwell, .	ib.
187.	—— Propell'g vessels in shoal water,	J. W. Wetmore, .	ib.
188.	—— Gas Generators, .	Ezra W. Whitehead and J. L. Conklin,	ib.
189.	—— Umbrellas and Parasols, .	James Willis, . .	ib.
190.	—— Skiving Boot Counters,	Wm. Butterfield and Bradford Stetson,	ib.
191.	—— Graduating Lineal Measures,	S. C. Hubbard, ass'd to C. C. Hubbard,	ib.
192.	—— Steam Pressure Gauges, .	Joseph H. Miller and John Kailey,	189
193.	—— Gas Stoves, .	P. Mihan, ass'd to self & R. B. Fitts,	ib.
194.	—— Screw Wrench, .	G. C. Taft, ass'd to Henry W. Mason,	ib.
195.	—— Portable Steam Saw'g Machine,	Samuel R. Wilmot & R. G. Fairbanks,	ib.
196.	—— Ladies' Skirts, .	Edward F. Woodward, .	ib.
197.	—— Spring Bed Bottoms, .	G. W. Dow, ass'd to self & W. F. French,	ib.
198.	—— Preparing Liquid Rose Pink,	John W. Perry, ass'd to J. W. Gates,	ib.
199.	—— Keeper for Locks and Latches,	Andrew Patterson, ass'd to J. H. Jones,	ib.
200.	—— Knitted Fabrics, .	J. Vickerstaff, ass'd to M. Landenberger,	190
201.	—— Vault and Platform Light, .	J. C. Wolvin, ass'd to self & G. Peckham,	ib.
202.	—— Faucets, .	David N. B. Coffin, Jr., ass'd to others,	ib.
203.	—— Gas Generators, .	Napoleon Aubin, . .	ib.
204.	—— Printing Presses, .	Franklin L. Bailey, .	ib.
205.	—— Reducing Top-snils, .	Thomas Batty, . .	ib.
206.	—— Polishing Raw Hide Whips,	Eugene Blattner, .	ib.
207.	—— Hold'g & Adjust'g Plane Irons,	Willard W. Chipman, .	ib.
208.	—— Grinding Mill, .	Ezra Coleman, .	ib.
209.	—— Saw-set, . .	Jacob Erdle, . .	ib.
210.	—— Fastening Handles to Baskets,	Anthony Faas, .	191
211.	—— Vapor Burners, .	Horatio Fairbanks, . .	ib.
212.	—— Vane governor for S. Engines,	Francis Gustine, .	ib.
213.	—— Valvular arrangement for faucets,	Edward Hamilton, . .	ib.
214.	—— Pumps, . .	William H. Harrison, .	ib.
215.	—— Picker Sawing Machines,	John Haw, . .	ib.
216.	—— Constructing Stores, .	Wm. L. Johnson, .	ib.
217.	—— Manufacture of Iron,	Wm. Kelley, . .	ib.
218.	—— Sawing Mill, .	James G. Kennedy, .	ib.
219.	—— Boring Machines, .	Levi B. Lloyd, . .	ib.
220.	—— Finishing Brush Handles,	Thomas Mitchell, .	ib.
221.	—— Hydrant, .	George P. Perrini and J. E. Boyle,	192
222.	—— Ships' Windlasses, .	Joseph Pevey and Abraham Sanborn,	ib.

223. Improvement in Straightening Blades, Hiram Pierce, . . 192
224. —— Enameling Iron Pipes, . Edward Pierce, . . ib.
225. —— Steam Boiler Furnaces, Wm. Pike and Isaac R. Scott, . ib.
226. —— Lantern for Light'g Street Gas, John Reese and Charles N. Tyler, ib.
227. —— Draft Joint for Carriages, . Luther O. Rice, . ib.
228. —— Hardening Axes, &c., James N. Rockwell, . . ib.
229. —— Candlesticks, . Timothy Rose, . ib.
230. —— Boring Mills, . Wm. Sellers, . . ib.
231. —— Breech Loading Fire Arms, John Schenkl, . ib.
232. —— Securing, &c., Plane Irons, Wm. Stoddard, . . ib.
233. —— Cleaning Rice, . John F. Taylor, . 193
234. —— Caligraphs, . . Charles Thurber, . . ib.
235. —— Steam Boilers, . Harry Whitaker, . ib.
236. —— Elastic India Rubber Cloth, Charles Winslow, . . ib.
237. —— Excavating Tunnels, . Charles Wilson, . ib.
238. —— Photographs on Glass, J. W. Wykes, . . ib.
239. —— Attach'g air chambers to pumps, C. N. Lewis, ass'd to G. C. King, ib.
240. —— Water Metre, . P. H. Niles, ass'd to self & A. Douglass, 194
241. —— Taps & Dies for Cutt'g Screws, Ira A Richards, ass'd to Silas Stevens, ib.
242. —— Steam Whistles, . S W Warren, ass'd to self & D N Force, ib.
243. —— Bench Plane, . T. D. Worrall, ass'd to T. F. Caldicott, ib.
244. —— Throttle Valves for S. Engines, James H. Simmons, . ib.
245. —— Breech Loading Fire Arms, Gilbert Smith, . . ib.
246. —— Fountain Lamps, . Henry Wright Adams, . 237
247. —— Smelting Furnaces, . Charles C. Alger, . . ib.
248. —— Making Bolts and Rivets, . Joel R. Bassett, . ib.
249. —— Riveting Boilers, . Silvester Bennett, . . ib.
250. —— Iron Pavements for Streets, George W. Bishop, . ib.
251. —— Making Paper, . Edward B. Bingham, . 238
252. —— Blast Blower, . John Brough, . ib.
253. —— Making Horse Shoes, . Henry Burden, . . ib.
254. —— Radiator for Heat'g Apartments, I. H. Chester, . ib.
255. —— Flouring Mills, . Alfred T. Clark, . . ib.
256. —— Whiffle Tree Hook, . Anthony Cooley, . ib.
257. —— Earth Excavator, . Curtius Colby, . . ib.
258. —— Uterine Supporters, . W. E. Cooke, . 239
259. —— Gas Regulators, . John H. Cooper, . . ib.
260. —— Horse Shoe, . . Wm. Cooper, . ib.
261. —— Gas Burners, . Asa D. Gates, . . ib.
262. —— Separating Oily Particles, . Robert Hale, . . ib.
263. —— Harvesters, . Henry D. Hammond, . ib.
264. —— Adjustable Fender Posts, . Henry Harpold, . . ib.
265. —— Harvesting Machines, John K. Harris, . ib.
266. —— Electric Telegraphs, . Harrison G. Dyer, . . ib.
267. —— Sewing Machines, . Elias Howe, Jr., and Wm. R. Bliss, 240
268. —— Permutation Lock, . Frank G. Johnson, . ib.
269. —— Metallic pack'g for St'm pistons, Daniel Lasher, . . ib.
270. —— Iron Truss Frames for Bridges, Francis C. Lowthrop, . ib.
271. —— Self-acting Rake for Harvesters, Salem T. Lamb, . . ib.
272. —— Felling Trees, . Matthew Ludwig, . 241
273. —— Printing Ink, . George Matthews, . . ib.
274. —— Valve Gear for Steam Engines, Sidney Maltly, . ib.
275. —— Rak'g attachment for harvesters, John McIntosh, . . ib.
276. —— Harvesters, . David S. McNamara, . ib.
277. —— Fence, . . James Moore, . . ib.
278. —— Frame for Mowers & Reapers, J. A. Moore and A. H. Patch, ib.
279. —— Chilling Plough-shares, . James Oliver and Harvey Little, . ib.
280. —— Suspending Bedstead Slats, Charles Robinson, . ib.
281. —— Street Lanterns, . John Reese and Charles N. Tyler, ib.
282. —— Preserving Green Corn, . David Rowe, . . ib.
283. —— Fire Arms, . Jacob Shaw, Jr., . ib.
284. —— Opening & Closing Farm Gates, Wm. Sherwood, . . 242

285. Improvement in Brake for Wagons,	Hugh Slater,	.	242
286. —— Mortising Machine, .	Hezekiah B. Smith, .	.	ib.
287. —— Cartridges, . .	Gilbert Smith,	.	ib.
288. —— Rak'g Apparatus for Harvesters,	Daniel C. Smith,	.	ib.
289. —— Gas Generators, .	John W. Smith,	.	ib.
290. —— Harvesters, . .	Charles T. Stetson, .	.	243
291. —— Journal Boxes for Shafting, &c.,	Daniel Taylor,	.	ib.
292. —— Die Stock, .	James Teachout, .	.	ib.
293. —— Coloring Yarn in the Bobbin,	James Thomson and W. P. Wakelee,		ib.
294. —— Compound for Covering Hams,	Carter Van Vleck,	.	ib.
295. —— Starch from Maize, .	Wm. Watt, .	.	ib.
296. —— Condensing Liquids,	John Walton,	.	ib.
297. —— Slide Valves for Steam Engines,	Thomas Winans, .	.	ib.
298. —— Defecating Cane Juice, . .	Leonard Wray,	.	ib.
299. —— Locks, .	L. Baier, ass'd to Lippincott & Barr,		ib.
300. —— Ships' Capstans, .	R. Dunbar and J. F. Robertson, ass'd to Buffalo Eagle Iron Works Co.,		ib.
301. —— Automatic Rake for Harvesters,	Joseph S. Manning, .	.	244
302. —— Strap Pillow Block for Shaft'g,	G. H. Reynolds, as'd to self & Hinckley,		ib.
303. —— Sewing Machines, .	Wm., Assignor to Henry Sage,	.	ib.
304. —— Valves in Steam Cylinders,	M. E. Stacy, ass'd to W. John Way,		ib.
305. —— Cross-cut Sawing Apparatus,	H. F. Wilson, ass'd to self & H. B. West,		ib.

ADDITIONAL IMPROVEMENTS.

1. Improvement in Farm Gate, .	Charles N. Cole,	.	244
2. —— Cutter for Boring Wheel Hubs,	Leonard S. Maring, .	.	ib.
3. —— Spoke and Axe Helve Machine	Owen Redmond,	.	ib
4. —— Sawing Machine, .	Wm. P. Wood,	.	ib.

RE-ISSUES.

1. Improvement in Grass Harvesters,	Wm. F. Ketchum,	.	244
2. —— Gas Burners, .	Charles H. Johnson,	.	245
3. —— Cast Iron Car Wheels,	Anson Atwood,	.	ib.
4. —— Ships' Blocks, .	Cornelia Waterman, adm'x., &c.,	.	ib.
5. —— Locomotive Tenders, .	Ross and Thomas Winans,	.	ib.
6. —— Locomotive Fire Box,			
7. —— Guiding Line Ferry Boats, .	Wm. A. Jordan,	.	246
8. —— Flouring Mill, .	Joseph Weis, .	.	ib.
9. —— Portable Field Fence, .	James G. Hunt,	.	ib.
10. —— Looms for weaving Pile Fabrics,	M. C. Bryant, ass'd to E. B. Bigelow,		ib.
11. —— Manufacturing Hat Bodies,	James S. Taylor and Elijah Sturdevant,		ib.

DESIGNS.

1. For Cooking Stoves, .	T H Wood, H S Hubbell, J E Roberts,		246
2. —— Cook's Stoves, .	John D. Marshbank,	.	ib.
3. —— Busts of Napoleon Bonaparte,	Thomas Ball,	.	ib.
4. —— Stoves, . .	S. W. Gibbs, .	.	ib.
5. —— Coal Cooking Stoves,			
6. —— Wood Parlor Stoves, .	Conrad Harris and Paul W. Loiner,		ib.
7. —— Dining Room Stoves,			
8. —— Cooking Stoves, .	S. W. Gibbs, ass'd to North, Chase		
9. —— Stoves, . .	N. S. Vedder, & North,	.	247
10. —— Stoves, .	J. Beesley and E. J. Delaney, ass'd to Cresson, Stuart & Peterson,	.	ib.

July, 1857.

1. Improvement in Husking Corn, .	George W. Bachman,	.	247
2. —— Metal Separator, .	Edward Borlase,	.	ib.
3. —— Truss Bridges, .	Josiah Brown, Jr., .	.	ib.
4. —— Cutting Paste-board, &c.,	Denzlow Burhaus,	.	ib.
5. —— Steering Apparatus, .	Dexter H. Chamberlain,	.	ib.
6. —— Cutting Button Holes, .	Wm. Chicken,	.	ib.
7. —— Flow of Water through Pipes,	Thomas Clark,	.	ib.

8.	Improvement in Alcohol Blow Pipe,	Edward Conway,	247
9.	—— Grain Separators,	Amasa Curtis,	ib.
10.	—— Corn Harvesters,	Israel Dodenhoff,	ib.
11.	—— Box Window Frame,	Joseph B. Dodge,	248
12.	—— Husking Corn,	Wm. Emery, Jr.,	ib.
13.	—— Dry Sand Cores,	Wm. Gage and Richard B. Felthousen,	ib.
14.	—— Self-priming Gun Locks,	Mahlon I. Gallager,	ib.
15.	—— Tapping Nuts,	Almon B. Glover,	ib.
16.	—— Joiners' Ploughs,	Stephen Going,	ib.
17.	—— Straightening Veneers,	Joseph H. Goodell,	ib.
18.	—— Wrench,	John H. Hathaway,	ib.
19.	—— Upsetting Tire,	Rockwell Hazen and Volney Gibbs,	ib.
20.	—— Cutting Apparatus for Harvesters,	Joseph Irwin,	249
21.	—— Locks,	Henry Isham,	ib.
22.	—— Backing Electrotype Plates,	Albert H. Jocelyn,	ib.
23.	—— Panels of Field Fences,	Samuel F. Jones,	ib.
24.	—— Bell Shifter for Machinery,	Lucius J. Knowles,	ib.
25.	—— Sewing Machines,	E. T. Lathbury,	ib.
26.	—— Cutting Apparatus for Harvesters,	John P. Manny,	ib.
27.	—— Paper Cop Tubes,	Alexander McCausland,	ib.
28.	—— Railroad Car Stove,	James Spear,	ib.
29.	—— Gold Washer and Amalgamator,	T. V. Tavnay,	250
30.	—— Sash Lock,	Marcus P. Norton,	ib.
31.	—— Cooking Stoves,	Wm. Resor,	ib.
32.	—— Scroll Wheel for Harvesters,	Charles D. Rogers,	ib.
33.	—— Air Heating Stove,	Charles B. Sawyer,	ib.
34.	—— Shaft Coupling,	Edwin F. Shoenberger,	ib.
35.	—— Whiffle-trees,	David A. Smith,	ib.
36.	—— Embossing and Printing Press,	Samuel J. Smith and Charles Lockle,	ib.
37.	—— Covering for Drawing Rolls,	Joseph M. Smith,	ib.
38.	—— Melodeon Attachment,	D. L. Sprague, T. & R. Burditt,	ib.
39.	—— Brick Machine,	Stephen Ustick,	251
40.	—— File Cutting Machine,	Wm. Van Anden,	ib.
41.	—— Metallic Pens,	F. A. Wait,	ib.
42.	—— Operating Radial Cutters,	George W. Walton & Henry Edgarton,	ib.
43.	—— Applying Railroad Car Brakes,	Ira J. Webber,	ib.
44.	—— Lifting Jack,	Heber G. Seekins & Charles H. Goss,	ib.
45.	—— Trimming Hedges,	Wm. Wimmer,	ib.
46.	—— Rock Drilling Machine,	L. P. Jenks, ass'd to G. A. Gardner,	ib.
47.	—— " "	G. A. Gardner, ass'd to self & L P Jenks,	ib.
48.	—— Gas Stove,	P. Mihan, ass'd to R. B. Fitts,	252
49.	—— Pumps,	H. Pease, ass'd to Eckler, Buswell & Co,	ib.
50.	—— Bit Brace,	H. W. Porter, ass'd to S. G. Porter,	ib.
51.	—— Bit or Drill Holder,	A. J. Smith, ass'd to self & G. W. Otis,	ib.
52.	—— Gas Stoves,	Thomas Walters, ass'd to S. Sherlock,	ib.
53.	—— Hay Rakes,	S. W. Wood, ass'd to L. H. Parsons,	ib.
54.	—— Making Railroad Chairs,	Robert Archer,	ib.
55.	—— Gauging and Filing Saws,	Emanuel Andrews,	ib.
56.	—— Fastening Artificial Teeth,	Theodore H. and James P. Bradish,	253
57.	—— Pen and Pencil Case,	Edward Babtis,	ib.
58.	—— Cultivator Ploughs,	George G. Black,	ib.
59.	—— Nail Plate Holder,	Wm. H. Battelle,	ib.
60.	—— Harvesters,	John P. Manny,	ib.
61.	—— Rigging Ships,	James E. Cole,	ib.
62.	—— Churns,	Charles H. Dana,	ib.
63.	—— Automatic Lathe,	Alexander Edmonds,	ib.
64.	—— Sealing Bottles, Cans, &c.,	Mills B. Espy,	ib.
65.	—— Washing Machines,	Adam Fisher,	ib.
66.	—— Mattresses,	Wm. P. Ford,	ib.
67.	—— Corn Planters,	Alvin Franklin,	ib.
68.	—— Rope Machines,	Ezekiel Guile,	ib.
69.	—— Packing of Pistons,	George H. Hoagland,	254

70.	Improvement in Piano-fortes,	G. Henry Hulskamp,	254
71.	—— Churns,	Silas Hewit,	ib.
72.	—— Use of Coal Tar in Furnaces,	Isaac G. Johnson,	ib.
73.	—— Shot Cartridges,	Wm. B. Johns,	ib.
74.	—— Applying Fly-wheel to Cars,	Charles T. Kipp and John Lawrenson,	ib.
75.	—— Hemp Drawing Machines,	Samuel Lownds,	ib.
76.	—— Seal for Car Doors, &c,	D. W. Long,	ib.
77.	—— Cultivators,	Howard Mann,	ib.
78.	—— Rak'g Apparatus for Harvesters,	John P. Manny,	ib.
79.	—— Mortise-boring Machines,	Hiram E. Paine,	ib.
80.	—— Spiral Catch for Breast Pins,	John F. Mascher,	ib.
81.	—— Seal for Railroad Freight Cars,	Henry D. Mears & Wm. Houlton, Jr.,	255
82.	—— " "		
83.	—— Self-setting Trap Hook,	Donald McLean,	ib.
84.	—— Locks,	L. F. Munger,	ib.
85.	—— Constructing Carriages,	Rufus Nutting,	ib.
86.	—— Cotton Gins,	Daniel Pratt,	ib.
87.	—— Lime Kilns,	Leonard Phleger,	ib.
88.	—— Locking cylindrical Door Bolts,	Charles G. Page,	ib.
89.	—— Draining Machine,	A. P. Routt,	ib.
90.	—— Oil Cans,	George W. and George H. Simmons,	ib.
91.	—— Fly-Trap,	Wm. T. Shannon,	ib.
92.	—— Wrest Pins for Pianos,	Gustav Schilling,	ib.
93.	—— Cutting Metal,	James Tetlow,	256
94.	—— Centring Machine,	Edward F. Whiton,	ib.
95.	—— Locks,	Wm. Whiting and Henry Pickford,	ib.
96.	—— Adjusting Round Tenon cutters,	Melyn Weatherington,	ib.
97.	—— Governors of Steam Engines,	A. F. Ward,	ib.
98.	—— Bureau Bedsteads,	Ethan Whitney,	ib.
99.	—— Cleaning Cotton,	L. S. Chichester, ass'd to H. G. Evans,	ib.
100.	—— Pumps,	B. Holly, ass'd to Silsby, and others,	ib.
101.	—— Cultivators,	H Schreiner, Jr., ass'd to self & G Lark,	ib.
102.	—— Lubricator,	Henry J. Hawkins,	257
103.	—— Cutting tenons by circular saws,	Wm. H. Harrison,	ib.
104.	—— Railroad Car Seats,	Bernard J. La Mothe,	ib.
105.	—— Ink'g Rollers for Print'g Presses,	E. E. Barrett,	ib.
106.	—— Feed motion for Sew'g machines,	Abraham Bartholf,	ib.
107.	—— Raising Sunken Vessels,	Thomas Bell,	ib.
108.	—— Planting Potatoes,	Galusha J. Bundy,	ib.
109.	—— Manufacturing Felt Cloth,	Thomas B. Butler,	258
110.	—— Sawing Mill,	Wm. M. Ferry, Jr.,	ib.
111.	—— Making Acid Sulphate of Lime,	Laurent Gaumotis and Sabin Martin,	ib.
112.	—— Rotating Harrows,	James B. Gascock,	ib
113.	—— Corn Harvesters,	G. D. Haworth,	ib.
114.	—— Planing Machines,	Jonathan Hall,	ib.
115.	—— Fire of coal burn'g Locomotives,	John M. Hartnett,	ib.
116.	—— Sewing Machines,	Abraham Hoagland,	ib.
117.	—— Signal or Alarm Bells,	George H. Hoagland,	ib.
118.	—— Spade or Dung-fork Handles,	George C. Howard,	ib.
119.	—— Metallic Bridge for Piano-fortes,	G. Henry Hulskamp,	ib.
120.	—— Hog Troughs,	Elmore Johnson,	259
121.	—— Sawing Mill,	Franklin B. Kendall,	ib.
122.	—— Corn Planters,	Norman A. Lewis,	ib.
123.	—— Bagasse Furnace,	George M. Longacre,	ib.
124.	—— Hand Wrench,	George B. Phillips,	ib.
125.	—— Railroad Car Couplings,	Wellington Prosser,	ib.
126.	—— Turning Carriage Hubs,	Alexander Rickart,	ib.
127.	—— Governor for Water Power,	Nathan Scholfield,	ib.
128.	—— Garden Hoes,	Solomon Shetter,	ib.
129.	—— Cotton and Cane Cultivators,	Thomas E. Shannon,	ib.
130.	—— Straw Cutters,	Jonathan L. Sullivan,	260
131.	—— Roofing Compositions,	John B. Wands,	ib.

133.	Improvement in Grain Separators,	Wm. Zimmerman,	260
132.	—— Stopping Shot Holes in Vessels,	John Woodville,	ib.
134.	—— Retort Covers,	J. R. Floyd, ass'd to T. C. Kibbe,	ib.
135.	—— Rendering Joints Steam-tight,	Wm. S. Gale, ass'd to Peter Pillon,	ib.
136.	—— Digging Potatoes,	Joseph Heulings, ass'd to self & others,	ib.
137.	—— Diaper Pins,	J. Heilman, ass'd to Ignatius Sturn,	ib.
138.	—— Photography,	H. A. Marchant, ass'd to E. D. Marchant,	ib.
139.	—— Spark Arresters,	J. F. Page, ass'd to self & J. Landy,	ib.
140.	—— Cylindrical Door Bolts,	Charles G. Page,	ib.
141.	—— Sawing Machines,	Thomas J. Alexander,	261
142.	—— Driving Circular Saws,		
143.	—— Governor for Wind-mills, &c.,	Ethan Allen,	ib.
144.	—— Fuse-making Machine,	Albert F. Andrews,	ib.
145.	—— Segmental Truss for Bridges,	George S. Avery,	ib.
146.	—— Pill Machines,	James C. Ayer,	ib.
147.	—— Automatic Lathe,	Samuel N. Baker,	ib.
148.	—— Tanning Compositions,	Ira Carle,	262
149.	—— Auger Handle Fastening,	Wm. N. Clark,	ib.
150.	—— Smut Machines,	Everard M. Clark,	ib.
151.	—— Pendulum Levels,	Calvin Cole,	ib.
152.	—— Artificial Legs,	R. H. Nicholas and Douglass Bly,	ib.
153.	—— Sawing Staves,	Elisha K. Collins,	ib.
154.	—— Tempering Scythes,	C. P. Crossman,	ib.
155.	—— Planing Machines,	George Darby and James E. Young,	ib.
156.	—— Seaming Sheet Metal Roofs,	Lucian Fay,	ib.
157.	—— Spark Arresters,	Henry H. Graham,	ib.
158.	—— Punching & Shaping Metals,	George Haseltine,	ib.
159.	—— Mop Heads,	James S. Harris,	263
160.	—— Mortising Chisel,	Christian J. Heistand,	ib.
161.	—— Governor for Engines, &c.,	Frederick W. Howe,	313
162.	—— Fastening Breast-pins,	Charles F. Kolb,	ib.
163.	—— Cleaning Rice,	Philip R. Lachicotte & T. B. Bowman,	ib.
164.	—— Mortising and Boring Machines,	J. M. Jay,	ib.
165.	—— Mastic Roofing Compositions,	Samuel K. Lighter & James A. Morrell,	ib.
166.	—— Spark Arresters,	Ethebred May,	ib.
167.	—— Lime Kilns,	John McGregor,	ib.
168.	—— Projectiles for smooth bored guns,	John L. McConnel,	314
169.	—— Spindle for Door Knobs,	Orrin Newton,	ib.
170.	—— Lime Kilns,	Clark D. Page,	ib.
171.	—— Fastenings for Carpets,	Washington H. Penrose,	ib.
172.	—— Bit-Brace,	Charles C. Plaisted,	ib.
173.	—— Raising Sunken Vessels,	John Ponton,	ib.
174.	—— Cylinders of Steam Engines,	John A. Reed,	ib.
175.	—— Guard-fingers for Harvesters,	Adam R. Reese,	ib.
176.	—— Treating Paper Stuff,	Julius A. Roth,	ib.
177.	—— Drilling Rock,	Moses T. Rowlands,	ib.
178.	—— Fastenings for Carpets,	Richard E. Schrœder,	315
179.	—— Corn Planters,	Charles Schnepf,	ib.
180.	—— Receiving Passengers' Fares,	John B. Slawson,	ib.
181.	—— Hemp Brakes,	Stephen Stafford,	ib.
182.	—— Paring and Slicing Apples,	R. W. Thickins,	ib.
183.	—— Stuffing Horse Collars,	J. C. Tobias,	ib.
184.	—— Oscillating Steam Engines,	John Wallace,	ib.
185.	—— Revolving Fire Arms,	James Warner,	ib.
186.	—— Boot and Shoe Soles,	Charles Warren,	ib.
187.	—— Shingle Machines,	Elbridge Webber,	ib.
188.	—— Shingle Machines,	Wm. Wood,	ib.
189.	—— Gate Latch,	A. E. Morgan, ass'd to self and others,	316
190.	—— Cultivators,	Harrison Ogborn and George Taylor,	ib.
191.	—— Sash Fastener,	F. Tarbell, ass'd to self & D. C. Bicknell,	ib.
192.	—— Fixtures for Curtain Rollers,	L. White, ass'd to self & E. P. White,	ib.

ADDITIONAL IMPROVEMENTS.

1. Improvement in Winnow'g Machines, Joseph Keech and Stephen Stillwell, 316
2. —— Hub Borer, John Shaerer, ib.
3. —— Fire Arms, F. D. Newbury, ass'd to R. V. De Witt, ib.
4. —— Kneading Dough, John L. Rolland, ib.
5. —— Steam Engines, Patrick Clark, ib.
6. —— Gutta-percha Stereotypes, Leonardo Westbrook, ib.

RE-ISSUES.

1. Improvement in Cut'g out Boots, &c., John Chilcott and Robert Snell, 316
2. —— Bomb for Killing Whales, N. Scholfield, ass'd to self & W. Wright, 317
3. —— Railroad Chairs, S. S. Cox, ass'd to N. Y. Railroad Chair Co. ib.

DESIGNS.

1. For Stove Ornaments,
2. —— Stove Ornaments, } Samuel D. Vose, 317
3. —— Stove Ornaments,
4. —— Stoves, J. C. Smith ass'd to W. Resor & Co., ib.
5. —— Stoves,
6. —— Stoves, } S. W. Gibbs, ass'd to Rathbone & Co., ib.
7. —— Stoves,
8. —— Grate or Stove Fronts, J. E. Bendix, ass'd to S. B. Sexton & Co., ib.
9. —— Cooking Stoves, Maguire, Reed & Wright, ass'd to C. Gilbert, ib.
10. —— Stoves, N. S. Vedder, ass'd to North, Chase & North, ib.
11. —— Stoves,
12. —— Stoves, } S. W. Gibbs, ass'd to Rathbone & Co., ib.
13. —— Parlor Stoves, E. J. Cridge, ib.
14. —— Cooking Stoves, James R. Hyde, ib.
15. —— Clock Cases, Pietro Cinquinni, ib.
16. —— Iron Railings, H. Jenkins, ass'd to N. Y. Wire Rail'g Co. ib.
17. —— Pens and Pen Holders, William Ball, 318

August, 1857.

1. Improvement in Power Looms, Andrew Allen, 318
2. —— Trucks for Locomotives, Levi Bissell, ib.
3. —— Nut Machines, Robert Brayton, ib.
4. —— Walking-stick Gun, Ira Buckman, Jr., ib.
5. —— Vapor Burners, D. H. Carpenter, ib.
6. —— Machines for Making Paper, Patrick Clark, 319
7. —— Coupling Thills to Vehicles, S. T. J. Coleman and I. W. Sibbett, ib.
8. —— Coal Stoves, J. A. Davis, ib.
9. —— Mode of Discharging Cannon, Josiah Dodge, ib.
10. —— Stock for Smoothing Planes, John F. W. Erdmann, ib.
11. —— Open'g & clos'g window blinds, } L. N. Fay and Wm. Mason, ib.
12. —— Window Blinds,
13. —— Steam Boilers, Robert Ferguson, ib.
14. —— Cultivator Teeth, F. R. Forsythe, ib.
15. —— Let-off Motion of Power Looms, Wm. H. Gray, ib.
16. —— Harvesters, Samuel Gumaer, ib.
17. —— File Cutting Machine, Wm. Hallowell and Levi Osborn, ib.
18. —— Bobbins for Roving & Stubbing, Isaac Hayden, 320
19. —— Sewing Machines, Abial C. Herron, ib.
20. —— Fictitious Ivory, Dr. Ludwig Held, ib.
21. —— Cutting Screws, Peter Hoffner, ib.
22. —— Sugar Boilers, Peter Holbrook, ib.
23. —— Protect'g horses necks from flies, Ezra L. Kurtz, ib.
24. —— Projectile for Rifled Cannon, Theodore T. S. Laidley, ib.
25. —— Stop-cock Gas Regulator, O. L. Lawson and A. A. Starr, ib.
26. —— Window Blind Slat Holder, William S. Mayo, ib.
27. —— Operating Window Blinds, James McMackin, ib.
28. —— Keys, Stuart Perry, ib
29. —— Compound Capstans for Ships, Charles Perley, 321
30. —— Machine for Forging Nails, S. J. Seely, ass'd to J. M. Hood, ib.

31.	Improvement in Harvesters,	N. C. Sherman and S. Lightcap,	321
32.	—— Propeller Blade,	George W. Swartz,	ib.
33.	—— Self-feeding Drill,	George C. Taft,	ib.
34.	—— Harvesters,	C. Tinker and J. A. Sprague,	ib.
35.	—— Beveling Staves, &c.,	J. Trahine and C. Vœbel,	ib.
36.	—— Boot Trees,	William Upfield,	ib.
37.	—— Shower Bath Apparatus,	Noah Warlick,	ib.
38.	—— Fictitious Ivory,	William M. Welling,	ib.
39.	—— Elastic Gore Cloth,	Charles Winslow,	ib.
40.	—— Grinding Knives,	Hankey&Stiles,Jr.ass'd to selves,Taylor,	322
41.	—— Pedestal for Railroad Cars,	D. H. Feger, ass'd to self & D. Shepherd,	ib.
42.	—— Joiners' Plane,	Thomas D. Worrall,	ib.
43.	—— Cleaning and Carding Moss,	Louis Boudreaux,	ib.
44.	—— Tawing & coloring skins & furs,	Harmon Hibbard,	ib.
45.	—— Mowing Machines,	William Bacheller,	ib.
46.	—— Lubricator for R. R. Car Axles,	William Baker,	ib.
47.	—— Rotary Veneer Machine,	Gilbert Bishop,	ib.
48.	—— Dredging Machine,	Asa Blood, Sen.,	323
49.	—— Glass Ware Holders,	Hiram Dillaway,	ib.
50.	—— Machines for Hulling cotton seed,	William R. Fee,	ib.
51.	—— Water Closets,	Lewis Fisher,	ib.
52.	—— Planing Machines,	Benaiah Fitts,	ib.
53.	—— Mowing Machines,	Alanson Gale,	ib.
54.	—— Whetting Plane Bits,	Jesse M. Gilstrap,	ib.
55.	—— Hominy Mills,	J. B. Cowdy and J. A. Welsh,	ib.
56.	—— Curtain Fixtures,	Nathaniel S. Graves,	ib.
57.	—— Brewer's Boiling Apparatus,	Adolph Hammer,	ib.
58.	—— Ships' Capstans,	Samuel Huse,	ib.
59.	—— Steering Steam Carriages,	Edward C. Jones,	324
60.	—— Ships' Capstans,	David Knoulton,	ib.
61.	—— Lubricator for R.R. Car Axles,	Alexander B. Latta,	ib.
62.	—— Arrangement of Faucets, &c.,	John C. Macdonald,	ib.
63.	—— Silk Dyeing Machines,	Nicholas Mary, Sen.,	ib.
64.	—— Indicat'g depth of water in ships,	G. B. Massey,	ib.
65.	—— Manufacture of Sulphuric Acid,	Alfred Monnier,	ib.
66.	—— Reefing Topsails,	James W. Norcross,	ib.
67.	—— Expres'g liquids from substances,	W. Needham and J. Kite,	ib.
68.	—— Bathing Apparatus,	John K. O'Neill,	ib.
69.	—— Sausage Cutters,	Jacob Peters,	325
70.	—— Gas Generators,	Allan Pollock,	ib.
71.	—— Safety Tops for Railway Cars,	Albert Potts,	ib.
72.	—— Operating Railroad Car Brakes,	E. R. Roe,	ib.
73.	—— Mash Cooling Machines,	Jesse Shilling,	ib.
74.	—— Grinding Surfaces for Grain mills,	Otis W. Stanford,	ib.
75.	—— Lime-Kilns,	Daniel Stephens,	ib.
76.	—— Filters,	John A. Thompson,	ib.
77.	—— Steam Gauges,	D. G. Wells,	ib.
78.	—— Tea Kettles,	Wm. Westlake,	ib.
79.	—— Reaping and Mowing Machines,	J. T. Whitaker and C. D. Read,	ib.
80.	—— Adjustments for Try-squares,	Joel Whitney,	ib.
81.	—— Smooth'g planed wooden surfac's,	Baxter D. Whitney,	326
82.	—— Polishing Stone and Glass,	George H. Wood,	ib.
83.	—— Spring Lancets,	J T Martin, ad'm. of W Parkinson, dec'd.,	ib.
84.	—— Press for Shearing & Punching,	B F Hooper, ass'd to self & R Ballou, Jr.,	ib.
85.	—— Marking Time of Workmen,	B. T. Harris ass'd to J. McKillop,	ib.
86.	—— Moulding Bricks,	I Z A Wagner, ass'd to Watson & Renwick,	ib.
87.	—— Sewing Machines,	W. C. Watson, ass'd to self and others,	ib.
88.	—— Turning Spools,	A D Waymoth, ass'd to self & H W Page,	ib.
89.	—— Hot Air Furnaces,	D. P. Weeks, ass'd to self & E. Seavey,	ib.
90.	—— Winnowing Mills,	M. Grover, ass'd to self and H. Seely,	327
91.	—— Pegging Boots and Shoes,	BF.Sturtevant, ass'd to self & ETownsend,	ib.
92.	—— Expanding Auger Bit,	A. Weeks, ass'd to self & O. W. Fiske,	ib.

93.	Improvement in Drop Press,	W. Wilson, Jr., ass'd to self and others,	327
94.	—— Setting Porcelain Teeth,	Martin Luther Wright,	ib.
95.	—— Tubular Shafting for Mills, &c.,	Zachariah Allen,	ib.
96.	—— Rotary Planing Cutters,	H. H. Baker,	ib.
97.	—— Gas Regulators,	John H. Cooper,	ib.
98.	—— Raking Apparatus for Harvesters,	Israel Dodenhoff,	ib.
99.	—— Grate Bars of Furnaces,	Edward Dugdale,	ib.
100.	—— Bending Metal Plates,	E. L. Gaylord,	328
101.	—— Cooking Stoves,	Sidney Godley,	ib.
102.	—— Hoops for Ladies' Skirts,	Charles S. Goodman,	ib.
103.	—— Manufacturing Metal Buttons,	Jared O. M. Ingersoll,	ib.
104.	—— Eye Shading Apparatus,	Francis H. Jones,	ib.
105.	—— Percussion Powder,	Magnus Kling,	ib.
106.	—— Dressing Saws,	Philo Maltby,	ib.
107.	—— Railroad Car Brakes,	James Mitchell,	ib.
108.	—— Bending Metal Plates,	Julius Perry,	ib.
109.	—— Inhaling Apparatus,	John C. Schooley,	ib.
110.	—— Constructing Artificial Hands,	William Selpho,	329
111.	—— Telegraphic Repeaters,	John E. Smith,	ib.
112.	—— Railroad Rails,	E. W. Stephens and R. Jenkins,	ib.
113.	—— Bakers for Cooking Stoves,	P. P. Stewart,	ib.
114.	—— Shears for Cutting Metal,	Timothy F. Taft,	ib.
115.	—— Hot-air Registers,	Joseph V. Tibbitts,	ib.
116.	—— Twisting Curb Chains,	Lauriston Towne,	ib.
117.	—— Portable Horse Powers,	Daniel Woodbury,	ib.
118.	—— Tanning Liquids,	Leo de La Peyrouse, ass'd to MJAGuiet,	ib.
119.	—— Self-acting Mules for Spinning,	George Wright,	330
120.	—— Filters,	Wm. W. Ayres,	ib.
121.	—— Wetting and Cutting Paper,	Moses S. Beach,	ib.
122.	—— Watch Keys & Finger Rings,	Elihu Bliss,	ib.
123.	—— Manufacturing Hat Bodies,	Joseph Booth,	ib.
124.	—— Hermetically Sealing Cans,	Wm. Borrman,	ib.
125.	—— Umbrellas and Parasols,	Sheldon Canfield,	ib.
126.	—— Piercing Blind Slats,	John Carpenter,	ib.
127.	—— Separating Ore,	Thomas J. Chubb,	ib.
128.	—— Swage for Setting Saw Teeth,	Pearson Crosby,	331
129.	—— Brick Machines,	P. S. Devlan,	ib.
130.	—— Washing Machines,	Hiram F. Everitt,	ib.
131.	—— Self-waiting Tables,	Wm. B. and Jonathan H. Farrar,	ib.
132.	—— Pin Sticking Machine,	Thaddeus Fowler,	ib.
133.	—— Ships' Berths,	Henry Getty,	ib.
134.	—— Washing Machines,	Wm. M. Hammond,	ib.
135.	—— Water-tight mouths of trunks, &c.,	Charles H. Hinckley,	ib.
136.	—— Hay and Manure Forks,	William Jones,	ib.
137.	—— Steam Pressure Regulators,	Lucius J. Knowles,	ib.
138.	—— Projectile for Rifled Cannon,	Theodore T. S. Laidley,	332
139.	—— Washing Machines,	Justin Loomis,	ib.
140.	—— Cupola Furnaces,	Philip W. Mackenzie,	ib.
141.	—— Cutting Apparatus of Harvesters,	Pells Manny,	ib.
142.	—— Ships' Capstans,	Charles E. Marwick,	ib.
143.	—— Water Vessels,	Wm. Moultrie,	ib.
144.	—— Cooking Ranges,	Samuel Pierce,	ib.
145.	—— Process for Printing,	Paul Pretsch,	ib.
146.	—— Boring Machine,	Emmett Quinn,	ib.
147.	—— Bending Machines,	Lewis Raymond,	ib.
148.	—— Glass Furnaces,	Samuel Richards,	333
149.	—— Ink Stands,	Thomas Robjohn,	ib.
150.	—— Looms,	Edwin A. Scholfield,	ib.
151.	—— Washing Machines,	Isaac A. Sergeant,	ib.
152.	—— Packing Rotary Steam Engines,	Gerard Sickles,	ib.
153.	—— Fence for Poultry Yards,	William P. Thomas,	ib.
154.	—— Vibrating Shears,	John Toulmin,	ib.

155.	Improvement in Sawing Machines,	Stephen Woodward,	333
156.	—— Washing Machines,	Abram Wood,	ib.
157.	—— Sewing Machines,	William Wickersham,	ib.
158.	—— "	"	334
159.	—— Automatic Rakes for Harvesters,	J. W. Brokaw, ass'd to self and others,	ib.
160.	—— Sewing Machines,	H. Behn, ass'd to self & T. Sewell,	ib.
161.	—— "	S. Larkin, ass'd to Wheeler & Wilson,	ib.
162.	—— Cultivators,	C.H.Sayre, ass'd to self & S. Remington,	ib.
163.	—— Boot Crimps,	W. W. Willmott, ass'd to self & others,	ib.
164.	—— Machine for Folding Paper,	C.Wiggins, A.H.Nordyke, B.Strawbridge,	ib.

ADDITIONAL IMPROVEMENT.

1.	Improvement in Hoisting Winches,	Joel Bryant,	334

RE-ISSUES.

1.	Improvement in Making Spoons,	C. Packer, ass'd to Wm. Mix,	335
2.	—— Distributing Apparatus,	Alfred T. Clark,	ib.
3.	—— Rice Hullers,	Peter McKinlay,	ib.
4.	—— Boot Crimps,	J. M. Reed, assignee of J. Copeland,	ib.
5.	—— Reed Musical Instruments,	Jeremiah Carhart,	ib.
6.	—— Glass Journal Box,	Edward Campbell,	ib.
7.	—— Regulators for Wind-wheels,	Joseph Dunkley,	ib.
8.	—— Ovens,	W. E. Treadwell and W. Hustace,	ib.
9.	—— Capstans for Steamboats,	John Schaffer,	336

DESIGNS.

1.	For Statues of General Warren,	H. Dexter, ass'd to Wm. Carleton,	336
2.	—— Stoves,	Dulley and Mann, ass'd. to G.W. Eddy,	ib.
3.	—— "	S W Gibbs, ass'd to Young & Brother,	ib.
4.	—— Cooking Stoves,	Elias Young,	ib.
5.	—— Stoves,	Thomas Barry,	ib.
6.	—— "		
7.	—— "		
8.	—— "		
9.	—— "		
10.	—— "		
11.	—— "		
12.	—— "	Samuel H. Ransom,	ib.
13.	—— "		
14.	—— "		
15.	—— "		
16.	—— "		
17.	—— Clock Case Fronts,	Pieto Cinquinni,	ib.
18.	—— Bricks,	G. W. Sholl and Charles Stewart,	ib.
19.	—— Stoves,	Thomas D. Worrall,	ib.

September, 1857.

1.	Improvement in Cutting Corn, &c.,	John Augspurger,	336
2.	—— Thills for Two-wheeled vehicles,	Philip Baillau,	ib.
3.	—— Sealing Cans,	Edwin Bennett,	ib.
4.	—— Rakes,	Andrew J. Blodgett,	ib.
5.	—— Wiring Blind Rods,	Byron Boardman,	ib.
6.	—— Spooling Thread,	Charles K. Bradford,	337
7.	—— Coal Sifters,	Wm. D. Brown,	ib.
8.	—— Seeding Machines,	Charles W. Cahoon,	ib.
9.	—— Straw Cutters,	Aury G. Coes,	ib.
10.	—— Ore Separator,	Thomas J. Chubb,	ib.
11.	—— Washing Bottles,	Henry N. Degraw,	ib
12.	—— Swedging Hatchet Heads,	Levi Dodge,	ib.
13.	—— Sawing Staves,	P. Deal and J. Greenman,	ib.
14.	—— Saw Clamp,	Leonard O. Fairbanks,	338
15.	—— Life Preserving Berths for vessels,	Elbridge Foster,	ib.
16.	—— Locking Faucets,	Henry Getty,	ib.
17.	—— Animal Traps,	George Hart,	ib.

18. Improvement in Harvesting machines, James Haviland, . . 338
19. —— Spirit Stills, . Edward Herring, . ib.
20. —— Surf and Life Boats, . Richard C. Holmes, . . ib.
21. —— Raking Device for Harvesters, Stephen R. Hunter, . ib.
22. —— Hub for Carriage Wheels, . J. W. Jackson and L. W. Burchinal, ib.
23. —— Movement for Sawing Mills, George D. Lund, . . 339
24. —— Sack Fastener, . Wm. P. and J. E. B. Maxson, ib.
25. —— Chimney Caps, . Ira Mayhew, . . ib.
26. —— Shower Bath Apparatus, . Wm. Meyer, . . ib.
27. —— Sewing Machines, . Orson C. Phelps, . . 380
28. —— Gas Regulators, . John H. Powers, . ib.
29. —— Cotton Seed Planters, Thomas J. Rogers, . . ib.
30. —— Lanterns, . . Joseph H. Bohrman, . ib.
31. —— Adjusting Carriage Tops, C. W. Saladee, . . ib.
32. —— Whiffle-trees to Canal Boats, Andrew Seaman, . ib.
33. —— Smoothing Irons, . Wm. F. Shaw, . . ib.
34. —— Portable Gas Generators, Warren A. Smith, . ib.
35. —— Circular Stair Railings, . George S. Stewart, . . ib.
36. —— Suspending Eaves-troughs, James A. Waltrous, . 381
37. —— Planing Saw Teeth, . John N. Wilkins, . . ib.
38. —— Machine for Forging Metals, Elbridge Wheeler, . ib.
39. —— Pipe Coupling, . Elizur Wright, . . ib.
40. —— Percussion Cap Primers, George W. Baker, . ib.
41. —— Moving Stores, &c., in case of fire, A. Blood, Sr., and R. W. Brown, ib.
42. —— Attaching Scythes to Snaths, O. Clark, ass'd to A. H. Pinney, ib.
43. —— Sliding Rest for Lathes, . E.S.Gardiner, ass'd to Smith, Gould&Co. ib.
44. —— Crozing and Chamfering Staves, H.L.McNish, ass'd to self & D.C. Butler, ib.
45. —— Condensers for List Speeders, W. Mattison, ass'd to J. C. Whitin, ib.
46. —— Head Rest for R. R. Car Seats, W. M. McCauly, ass'd to J. N. McIntire, ib.
47. —— Carding Engines, . H. N. Gambill and S. F. Burgee, 382
48. —— Casting Bearings in Iron wheels, Charles Taylor, . . ib.
49. —— Socket-coupling for Lathes, George N. Towbridge, . ib.
50. —— Coal Sifters, . . Sanford Adams, . . ib.
51. —— Seed Planters, . Cyrus C. Aldrich, . ib.
52. —— Corn Planters, . D. R. Alden, . . ib.
53. —— " . Horace R. Allen, . ib.
54. —— Tubes for S. Pressure Gauges, E. H. Ashcroft, . . ib.
55. —— Cutting figures out of sheet metal, C. P. S. Betts, . . ib.
56. —— Insulated Telegraph Wires, Samuel C. Bishop, . . ib.
57. —— Reversible Car Coupling, . Joseph Boothroyd, . 383
58. —— Manufacturing Verdigris, Ludwig Brumlen, . . ib.
59. —— Gas Retorts, . . Saunders Coates, . ib.
60. —— Wrench, . H. M. Clark, . . ib.
61. —— Vapor Lamps, . Joseph G. Gilbert, . ib.
62. —— Metallic Packing for Pistons, George H. Corliss, . . ib.
63. —— Drying Grain, &c., . Christian Custer, . ib.
64. —— Tighten'g tire of carriage wheels, James M. Dick, . . ib.
65. —— Corn Shellers, . Andrew Dillman, . ib.
66. —— Seed Planters, . I. W. Ells and J. Charlton, . ib.
67. —— Mowing Machines, . George C. Dolph, . ib.
68. —— Breech Loading Fire Arms, J. Durell Greene, . . ib.
69. —— Ramming under cross-ties of RR., Richard B. Harrison, . ib.
70. —— Hand Seed Planters, . Joel Haines, . . 384
71. —— Straw Cutters, . P. Hill and C. E. Jones, . ib.
72. —— Attach'g wires to bell Telegraphs, Henry Hochstrasser, . . ib.
73. —— Corn Planters, . D. W. Hughes, . . ib.
74. —— Transmitting Telegraph Signals, John P. Humaston, . . ib.
75. —— Automatic Railroad Car Brake, W. R. Jackson, . ib.
76. —— Sheep Shearing Machines, J. V. Jenkins, . . ib.
77. —— Lasting Boots and Shoes, . John Kimball, . . 385
78. —— Wear Iron for Carriages, I. George Sefter, . . ib.
79. —— Bolt for Safes, . Stuart Perry, . ib.

80.	Improvement in Scythe Snathes,	Abner H. Pinney,	385
81.	—— Signals for Steamboats,	Albert Potts,	ib.
82.	—— Wash Mixtures for Woolens, &c.	Wm. Reisig,	ib.
83.	—— Mortising Chisel,	John A. Scroggs,	ib.
84.	—— Locks,	John P. Sherwood,	ib.
85.	—— Grinding Mills,	Wm. Stauffer,	ib.
86.	—— Door Spring,	E. P. Torry and W. B. Tilton,	ib.
87.	—— Churns,	Daniel E. True,	386
88.	—— Brick Machines,	Stephen Ustick,	ib.
89.	—— Blast Furnace,	Samuel Wilkes,	ib.
90.	—— Washing Machines,	Philip N. Woliston,	ib.
91.	—— Padlock,	Linus Yale,	ib.
92.	—— Manufac'g wooden Wash-boards,	L. B. Bachelier, ass'd to West & Co.,	ib.
93.	—— Saccharine Evaporators,	J. Bour, ass'd to C. Parlange,	ib.
94.	—— Harvesters,	C. M. Sufkin, ass'd to N. Sufkin,	ib.
95.	—— Cultivator Teeth,	E.L Freeman, ass'd to self, & Lord & Co.	ib.
96.	—— Pegging Boots and Shoes,	S. D. Tripp, ass'd to self and L. Hill,	ib.
97.	—— Extension Gas Tubes,	Charles Monson,	387
98.	—— Sash Lock,	Wm. Patton,	ib.
99.	—— Machine for Forging Nuts,	E. Pay and S. Hall,	ib.
100.	—— Machines for Hulling Rice,	Wilson Ager,	ib.
101.	—— Machines for Cleaning Rice,		
102.	—— Grinding Mill,	Aaron Arnold,	ib.
103.	—— Flour Bolt,	N. Baumann,	ib.
104.	—— Machines for Kneading Dough,	Hiram Berdan,	ib.
105.	—— Machines for harden'g hat bodies,	Joseph Booth,	ib.
106.	—— Sustaining Window Sash,	Edward T. Briggs,	388
107.	—— India Rubber Paint,	Wm. and Wm. A. Butcher,	ib.
108.	—— Gas Generators,	John Butler,	ib.
109.	—— Excavators,	Ze Butt,	ib.
110.	—— Mastic Roofing,	Wm. H. Carver and J. Beckley,	ib.
111.	—— Mowing Machines,	A. H. Caryl,	ib.
112.	—— Reaping Machines,		
113.	—— Invalid Beds,	George H. Clark,	ib.
114.	—— Making Paper Pulp from Ivory,	William N. Clark,	ib.
115.	—— Hanging Mill Stones,	Edwin Clark,	ib.
116.	—— Ships' Pumps,	A. Coates and S. M. Perry,	389
117.	—— Socket for Bolts,	H. W. Collender,	ib.
118.	—— Expanding Spectacle Bows,	George N. Cummings,	ib.
119.	—— Street Sweeping Machines,	John Critcherson,	ib.
120.	—— Bridges,	Charles H. Earle,	ib.
121.	—— Operating Valves of S. Engines,	Robert H. Fletcher,	ib.
122.	—— Painters' Easels,	George Gillett,	ib.
123.	—— Safety Fuse Compositions,	Edwin Gonez and Wm. Mills,	ib.
124.	—— Operating Window Sash,	John C. Grant,	ib.
125.	—— Coolers for Breweries,	Adolph Hammer,	ib.
126.	—— Feathering Paddle-wheels,	Lewis T. Howard,	ib.
127.	—— Treating Cotton & Linen Waste,	Eben Norton Horsford,	390
128.	—— Treating Fibrous &c., substances,	J. A. Jilson and Henry Whinfield,	ib.
129.	—— Machine for Pointing Wire,	C. Jilson,	ib.
130.	—— Belt Tool,	D. A. J. Lamson,	ib.
131.	—— Spoke Machine,	Samuel Lord,	ib.
132.	—— Harness for Looms,	George Matoon,	ib.
133.	—— Preparing Tracing Muslin,	Jesse K. Park,	ib.
134.	—— Regulating of Wind-wheels,	Francis Peabody,	ib.
135.	—— Valve Gear for Steam Engines,	John C. Pennington,	ib.
136.	—— Tenoning Machines,	Perry Putnam and John E. Crane,	ib.
137.	—— Watch-makers' Lathe,	Boswell H. St. John,	ib.
138	—— Boxes for Preserving Alkalies,	George Thompson,	ib.
139.	—— Drip Pots for Sugar Houses,	John Turl,	391
140.	—— Illuminating Gas Apparatus,	Charles B. Warring,	ib
141.	—— Ball Cartridges,	Lemuel Wells,	ib.
142.	—— Diaphragms for Photog. cameras,	J. Robert Werner,	ib.

143.	Improvement in Brewers' Coolers,	Adam Wood,	391
144.	—— Attachm't for Reap'g Machines,	Christian Yost,	ib.
145.	—— Type-setting and Distributing,	Timothy Alden,	ib.
146.	—— Manufacturing Shingles,	James E. Young,	392
147.	—— Reefing and Furling Sails,	G.W. LaBaw, ass'd to self & C.A.Durgin,	ib.
148.	—— Saw Filer,	J.J.Near, ass'd to E.Near & L.Vandusen,	393
149.	—— Working Steam Valves,	Ruberts & Crumbie ass'd to J. Benson,	ib.
150.	—— Control'g cog-gear sash balances,	J. McMurtry, ass'd to D. Wiehl,	ib.
151.	—— Brick Machines,	G.J.Washburn, ass'd to self &AL Hobart,	ib.
152.	—— Boot and Shoe Sole Cutters,	P. Wells, ass'd to Samuel Mower,	ib.
153.	—— Locks,	H. W. Covert,	ib.
154.	—— Grain and Grass Harvesters,	J. W. Baltzly and Wm. Hobson,	ib.
155.	—— Gas Burners,	Wm. W. Bachelder,	ib.
156.	—— Machine for Binding Grain,	Joseph F. Black,	ib.
157.	—— Horse Powers,	G. G. Burt, Abram and G. F. Wright,	ib.
158.	—— Life Boats,	Mortimer M. Camp,	ib.
159.	—— Bearing for Mill Stone drivers,	Edwin Clark,	394
160.	—— Packing rings for steam engine,	Patrick Clark,	ib.
161.	—— Burglars' Alarm,	Simeon Coon,	ib.
162.	—— Trimming Boot and Shoe Soles,	Isaac A. Dunham,	ib.
163.	—— Reaping and Mowing Machines,	John G. Dunham,	ib.
164.	—— Port-folio or Music Stands,	Augustus Eliaers,	ib.
165.	—— Harvesters,	Andrew B. J. Flowers,	ib.
166.	—— Steam Heating Apparatus,	Edmund Gibbs,	ib.
167.	—— Loading Logs on Wagons,	Philander Gilbert,	ib.
168.	—— Locks,	Joseph L. Hall,	395
169.	—— Making White Lead,	Henry Hannen,	ib.
170.	—— Safety Clasp for Bracelets, &c.,	Isaac Hermann,	ib.
171.	—— Stirrups for Riding Saddles,	Dr. James Neil,	ib.
172.	—— Sleeve Fastener,	David C. Peacock,	ib.
173.	—— Journals of Axles,	George A. Prentiss,	ib.
174.	—— Hand Stamp,	T. J. W. Robertson,	ib.
175.	—— Filing and Setting Saws,	A. C. Smith and J. K. Creighton,	ib.
176.	—— Blocks of Iron or other pavements,	Barzillai C. Smith,	ib.
177.	—— Railroad Car Seats,	J. H. Swan,	ib.
178.	—— Trussed Bridge,	Abram S. Swartz,	ib.
179.	—— Carriage Prop,	Chauncy Thomas,	ib.
180.	—— Rotary Steam Engines,	D. C. Turner,	396
181.	—— Rakes for Harvesters,	Isaac Van Doren,	ib.
182.	—— Carding Engines,	W. H. Walton and G. H. Phinney,	ib.
183.	—— Nut Machine,	Samuel H. Whitaker,	ib.
184.	—— Valve Gear for Steam Engines,	Norman W. Wheeler,	ib.
185.	—— Diving Apparatus,	George Williamson,	ib.
186.	—— Fly-trap,	Samuel R. Wilmot,	ib.
187.	—— Fire Escape Ladder,	Henry Loewenberg,	ib.
188.	—— Coolers,	W. E. Messenger and H. Rehahn,	ib.
189.	—— Machine for Distributing Type,	W. H. Mitchell,	397
190.	—— Pencil Sharpeners,	J. W. Strange and S. Darling,	ib.
191.	—— Wrench,	H. D. Blake, ass'd to W. H. Warner,	ib.
192.	—— Harvesters,	S. Pennock, ass'd to self & M. Pennock,	ib.
193.	—— Manufacture of Clothes Pins, &c.,	J. Humphrey, ass'd to self & A. E. Perry,	ib.
194.	—— Circular Sawing Machines,	James H. Bachelder,	ib.
195.	—— Composition for Cover'g Meats,	J. J. Bate and F. S. Low,	398
196.	—— Lard Rendering Kettles,	J. J. Bate,	ib.
197.	—— Steam Pressure Gauges,	H. Bates,	ib.
198.	—— Opening Oysters,	W. Beach,	ib.
199.	—— Life Preservers,	Charles J. Bunker,	ib.
200.	—— Cribs of Horses' Stables,	Wm. Croasdale,	ib.
201.	—— Steam Boilers,	W. M. and J. B. Ellis,	ib.
202.	—— Fastenings for Jewelry,	J. T. Folwell,	ib.
203.	—— Preparing Roofing Cements,	R. T. Havens,	ib.
204.	—— Factitious Oils,	Joseph W. Harmon,	ib.

205.	Improvement in Hydraulic Engine,	John D. Heaton,	398
206.	—— Coating Hose Pipe,	C. H. Hinckley,	ib.
207.	—— Bit-Holders,	Benjamin B. Hill,	ib.
208.	—— Approach Opening Gate,	Charles A. Howard,	ib.
209.	—— Reed stops for musical instrum'ts,	Amos P. Hughes,	399
210.	—— Sewing Machines,	E. A. Jenks and J. Underwood,	ib.
211.	—— Cork Sole Stuff,	Wm. Johnson,	ib.
212.	—— Cutting Bungs,	Josiah Kirby,	ib.
213.	—— Setting Diamonds, &c.,	Isaac Lindsley,	ib.
214.	—— Gas Burners,	Wm. H. Lindsay,	ib.
215.	—— Hame-tug Fastening,	W. J. Lockwood,	ib.
216.	—— Uppers of boots&c.without seams,	Samuel Middleton,	ib.
217.	—— Burglars' Alarm,	E. M. and J. E. Mix,	ib.
218.	—— Separat'g oily matter from water,	James Naughten,	ib.
219.	—— Spikes,	Orrin Newton,	ib.
220.	—— Corn Shellers,	J. J. Parker,	ib.
221.	—— Cooking Stoves, Ranges, &c.,	Samuel Pierce,	ib.
222.	—— Manufacturing Pottery Ware,	Philip Pointon,	400
223.	—— Awning Frames for Horses,	N. Pullman,	ib.
224.	—— Fastening Cotton Bales, &c.,	Charles J. Provost,	ib.
225.	—— Protecting Buildings from Fire,	Thomas Odion,	ib.
226.	—— Joiners' Planes,	Thomas D. Worrall,	ib.
227.	—— Construction of Wire Fences,	J. B. Reyman,	ib.
228.	—— Stemm'g and Polish'g Pea Nuts,	Samuel Shepherd,	ib.
229.	—— Hemp Brakes,	Conrad Simon,	ib.
230.	—— Window for Locomotives, &c.,	H. Skinner,	ib.
231.	—— Drilling and Milling Machine,	Wm. D. Sloan,	ib.
232.	—— Horse Shoes,	Wm. Somerville,	ib.
233.	—— Hydro-carbon Vapor Lamp,	Isaac Suggitt,	401
234.	—— Opening and Closing Gates,	F. Thrasher and H. B. Horton,	ib.
235.	—— Pumps,	J. D. West,	ib.
236.	—— Hollow Metallic Lasts,	S. H. Whorf,	ib.
237.	—— Operat'g valves of steam engines,	S. L. Wiegand,	ib.
238.	—— Machines for Measuring Cloth,	Wm. W. Wythes,	ib.
239.	—— Marine Propelling Apparatus,	E. Campbell, ass'd to Page & Hodges,	ib.
240.	—— Tank for Locomotives,	John Kimball, ass'd to Robert Hale,	ib.

RE-ISSUES.

1.	Improvement in Looms,	D. W. Snell and S. S. Bartlett,	401
2.	—— Carding Engines,	Wm. H. Walton,	402
3.	—— Composition for Roofing,	James West,	ib.
4.	—— Elastic Gore Cloth,	Charles Winslow,	ib.
5.	—— Abdominal Supporter,	Julia M. Milligan,	ib.
6.	—— Looms,	W. V. Gee, ass'd to Atwater & Bristol M. Co.	ib.
7.	—— Stenciling Window Shades,	D. Lloyd, ass'd to Kelty & Ferguson,	403
8.	—— Coating Water Pipes,	Jonathan Ball,	ib.
9.	—— Cast Iron Car Wheels,	Anson Atwood,	ib.
10.	—— " "	"	ib.
11.	—— Seed Planters,	Solomon T. Holly,	ib.
12.	—— Photographs,	Edward Howell,	ib.
13.	—— Ladies' Skirts,	Edward F. Woodward,	ib.

DESIGNS.

1.	For Stoves,	N S Vedder, ass'd to North, Chase & North,	403
2.	—— Stoves,	Thomas Barry,	ib.
3.	—— Type,	Gorge Bruce,	ib.
4.	—— Sad Iron Stove,	S. W. Gibbs, ass'd to Winne & Abeil,	ib.
5.	—— Stoves,	Brown&others as'd to Abbot&Lawrence,	ib.
6.	—— Gas Burner Shades,	George B. Foster,	ib.
7.	—— Stands to Hold Shovels & Tongs,	J. Meyer, ass'd to M. Greenwood & Co.,	404
8.	—— " "	" "	ib.

Aluminum—Notice of the Corrosion of 57
——————— Monier's Improvement in the Manufacture of Sodium, and 210
Ammonia in Dew,—On the Quantity of . . . 283
Atlantic Telegraph Wire—Notice of the 57
Axles,—Notice of Williams' Patent Nut for . . . 209

Barometers,—Description of a Self-indicating Balance . . 104
Beams and Joists,—On Wrought Iron . . . 53
Bibliographical Notices,
Branston's Manual for Chemists, Druggists, &c., . . 287
Hand-book for Railroad Construction. By G. L. Vose, . 143
Villeroi's Solution of the Problem of the Trisection of an Angle, . 357
Blowing Machines,—Description of Improvement in Rotating . 119
Boiler Explosions,—On the Prevention of . . . 311
Bridge over Jordan Creek, Penna.,—Description of the Iron . 264
———, Notice of Walker's Counter-braced Arch and Truss . 416
Bridges and Mode of Counteracting them,—On the Disturbances of Suspension 231
——— on the Providence, Hartford, and Fishkill Railroad,—Description of the Timber 158
——— on Railroads,—Col. F. Hewson's Drill for Speedy erection of Temporary 304

Cast Iron Pipes,—Description of Daft's Improvement in . 285
Casting Pipes,—Description of Fire-clay Moulds for . . 106
Cecile,—Particulars of the Steamer . . . 352
Chemists, Druggists, &c.,—Notice of Branston's Manual for . 287
Coffee and Milk as an Article of Diet,—Experiments on . 349
Color,—On the Laws of 276
Coal and Iron in the Kingdom of the Two Sicilies, . . 411
Coupling for the Transmission of Motive Power,—Description of Wrigley's Friction 412

Dew,—On the Quantity of Ammonia in . . . 283
Druggists, Chemists, &c.,—Notice of Branton's Manual for . 287

Electric Lamp,—Description of an Improved . . . 284
Ellet (C.) On Improvement of the Ohio River, . . 263
Engines,—Description of Improvements in Rotary . . 119
Engraving by Light and Electricity—On . . 130
——————— in Relief,—Process for Photographing Drawings on Wood for 415
————, the Photo-galvanographic Process of . . 53
Excavations and Embankments,—Gillespie on the Calculation of Road 372
Explosions of Steam Boilers,—On the Prevention of the . 311

Fire-clay Moulds for Casting Pipes,—Description of . . 106
Fluid Metres,—Description of Improvements in 113, 117, 119, 202, 204, 206, 269, 270
Friction Coupling for the Transmission of Motive Power,—Description of Wrigley's 412
Fuel for Burning Bricks.—Artificial . . . 139
Furnaces,—Description of Williams's Apparatus for Charging . 350
————,—Remarks on Smokeless . . . 138, 283

Franklin Institute.
Proceedings of Meetings, . . 56, 140, 209, 286, 355, 415

Committee on Science and the Arts.
Report on C. M. Cresson's Cellular Gas Retort, . . 141
——————— Butcher's Composition for Coating Iron, . 143
——————— Gordon's Card Printing Press, . . 212
——————— Cooper's Rotary Hand Printing Press, . 213
——————— Imitation Marble Mantels, . . . 286

Committee on Meteorology.
Monthly Tables, . . . 216, 359, 418
——————— Diagrams, . . . 288, 360, 417

Galvanoplastic Copies,—Description of Moulds of Stearic Acid and Shel-lac for 139
Gas Retorts,—Report on C. M. Cresson's Cellular . . 141
Gases in Tubes,—On the Sounds produced by the Combustion of . 404
——-, Report of Experiments on the Value of Wood . 126
Gillespie (W. M.) On the Calculation of Road Excavations and Embankments, 372
Glass, its Preparation and Application,—On Soluble . 121, 194, 265
Gold to Light,—On the Relations of . . . 279
Guns,—Report of the Trial of the American Breech Loading . 345

Haswell (C. H.) Particulars of the Steamer Cecile, . . 352
Heat,—On the Influence of Metal upon Radiant . . 414
Hewson (Col. F.) Railroad Bridge Drill for Speedy Erection of Temporary Bridges on Railroads, . . 304
Hubbell (H.) On Computing Numbers of Balls in Triangular, Square, and Oblong Piles, . . . 20

Independence,—Particulars of the Steamer . . 410
Incrustation of Steam Boilers,—Notice of . . . 140
Ink in Cakes,—Process for Preparing Writing . . 136
Iron and Steel,—Improvement in the Manufacture of . . 353
——— Coal in the Kingdom of the Two Sicilies, . . 411
—— Beams and Joists,—On Wrought . . . 53
—— Bridge over Jordan Creek,—Description of the . 264
——,—Experiments on the Strength of Pillars of Cast . . 377
——,—On the Chemical Changes which Pig Iron undergoes during its Conversion into Wrought . . . 339
—— Pipes,—Daft's Improvement in Cast . . . 285
——,—Report on Butcher's Composition for Coating . 143

Jones (A. C.) On the Submarine Telegraph, . . . 160, 309
——————— Joints of Railroad Bars, . . 233
Joseph Whitney,—Notes on the Performance of the Steamer . 108

Lamp,—Description of an Improved Electric . . 284
——— for the Use of Miners,—Description of Mozard's Safety . 285
Light and Electricity,—On Engraving by . . 130
——,—On the Relation of Gold to . . . 279
Lunar Influence,—On a Law of Temperature depending upon . 414

Manufactures of Great Britain,—Statistics of the Textile . . 351
Marble Mantels,—Report on Imitation . . 286
Marbles,—New Process for Manufactures of Artificial . . 347
Metals upon Radiant Heat,—On the Influence of . . 414
Meteorological Tables, . . . 216, 359, 418
——————— Diagrams, . . . 288, 360, 417
Milk and Coffee as an article of Diet,—Experiments on . . 349

Ohio River,—Proposed Improvement of the 23, 73, 146, 217, 263, 289, 354, 361
Omnibus,—Notice of the Original . . . 411

Paddle Wheels,—Relative Efficiency of Screw and . . 1
Paper,—Process for Making Parchment . . 135, 137
Photo-galvanographic Process for Engraving, . . 53
Photograph Portraits,—Notice of Newell's . . 356
Piles,—Formula for Computing the number of Balls in Triangular, Square, and Oblong . . . 20
Pillars of Cast Iron,—Experiments on the Strength of . 377
Pipes,—Daft's Improvement in Cast Iron . . . 285
——,—Description of Fire-clay Mould for Casting . . 106
Printing Press,—Report on Cooper's Rotary Hand . . 213
————,————— Gordon's Card . . 212
Prosser (T.) On Super-heated Steam, . . . 199
Pump,—Description of an Improved Rotary . . 119
Photographing Drawings on Wood to be Engraved in Relief,—Process for . 415

Quartz,—On the Solution of 56

Railroad Bars,—On the Joints of 233
——— Bridge Drill for Speedy Erecting of Temporary Bridges, . 304
——— Car Brakes,—Notice of R. L. Smith's . . . 57
——— Construction,—Notice of Vose's Hand-book for . . 143
———,—Description of the Timber Bridges on the Providence, Hartford, and Fishkill 158
——— Developments. By J. M. Richardson, . . . 161
Railroads,—Notice of Brigham's Cast Iron Rail for City . . 140
Railway Accidents in Great Britain in 1856, . . . 85
——— Tracks,—Discussion on the Joints of . . . 58, 233
Railways,—On Permanent Way in Use on . . . 13
Retort,—Report on C. M. Cresson's Cellular Gas . . 141
Richardson (J. M.) On Railroad Developments, . . 161
Road Excavations and Embankments,—Gillespie on the Calculation of . 372
Roberts (W. M.) On Improvements of the Ohio River, 23, 73, 146, 217, 289, 361
——— ——— Reply to C. Ellet, Jr., Esq., . . 354
Rust-Spots in White Linen,—Process for Removal of . . 208

Safe for Preserving Valuables at Sea,—Notice of Glass' . 416
Safety Lamps for Miners,—Description of Mozard's . . 285
Sapphires,—Process for Making Artificial . . 134
Screw and Paddle Wheels,—Relative Efficiency of . . 1
Sewing Machines,—Law Report,—For Infringement of Howe's . 272
Shoes,—Notice of Marshall's Apparatus for Manufacturing Boots and . 356
Smith (E. W.) Particulars of the Steamer Independence, . 410
Sodium and Aluminum,—Notice of Monnier's Improvement in the Manufacture of . . . 210
Sounds produced by the Combustion of Gas in Tubes,—On the . 404
Steam Boilers,—Description of York's Indicator for . . 133
——— ———,—On the Prevention of the Explosions of . 311
——— Navigation,—On the High Speeds of . . . 5
———,—On Super-heated . . . 199
Steamer Cecile,—Particulars of the . . . 352
——— Independence,—Particulars of the . . 410
——— Joseph Whitney,—Notes of the Performance of the . 108
——— Wm. Jenkins,—Performance Compared with the Steamer Joseph Whitney, . . ib.
Steel,—Improvement in the Manufacture of Iron and . . 353
Stereoscope,—On the Telescopic . . . 139
Suspension Bridges,—On the Disturbances of, and Modes of Counteracting them, 231

Telegraph,—Notice of Cassell's Pantographic . . 125
———,—On the Submarine . . . 160, 309
Temperature,—Description of an Instrument for Registering the Changes of 281
——— depending upon Lunar Influence,—On a Law of . 414
Testing Machine for Strength of Materials,—Notice of Lowthorp's 416
Trisection of an Angle,—Notice of M. Villeroi's Solution of the Problem of the 357
Tubes,—On the Sounds produced by the Combustion of Gas in . 404

Water Metres,—Description of Improvements in 113, 117, 119, 202, 204, 206, 269, 270
——— Proofing Fabrics, Paper, &c.,—Description of Hoffman's Compound for 346
Weights and Measures,—Notes of a New System of Decimal . 286
Wilder (A. T.) Description of the Timber Bridges on the Providence, Hartford, and Fishkill Railroad, . . 158
William Jenkins,—Performance of the Steamer Joseph Whitney Compared with the Steamer . . 108
Wood Gases,—Report of Experiments on the Value of . . 126
——— to be engraved in Relief,—Process for Photographing Drawings on 415
Woody Fibres and their Applications,—On some Modifications of . 137